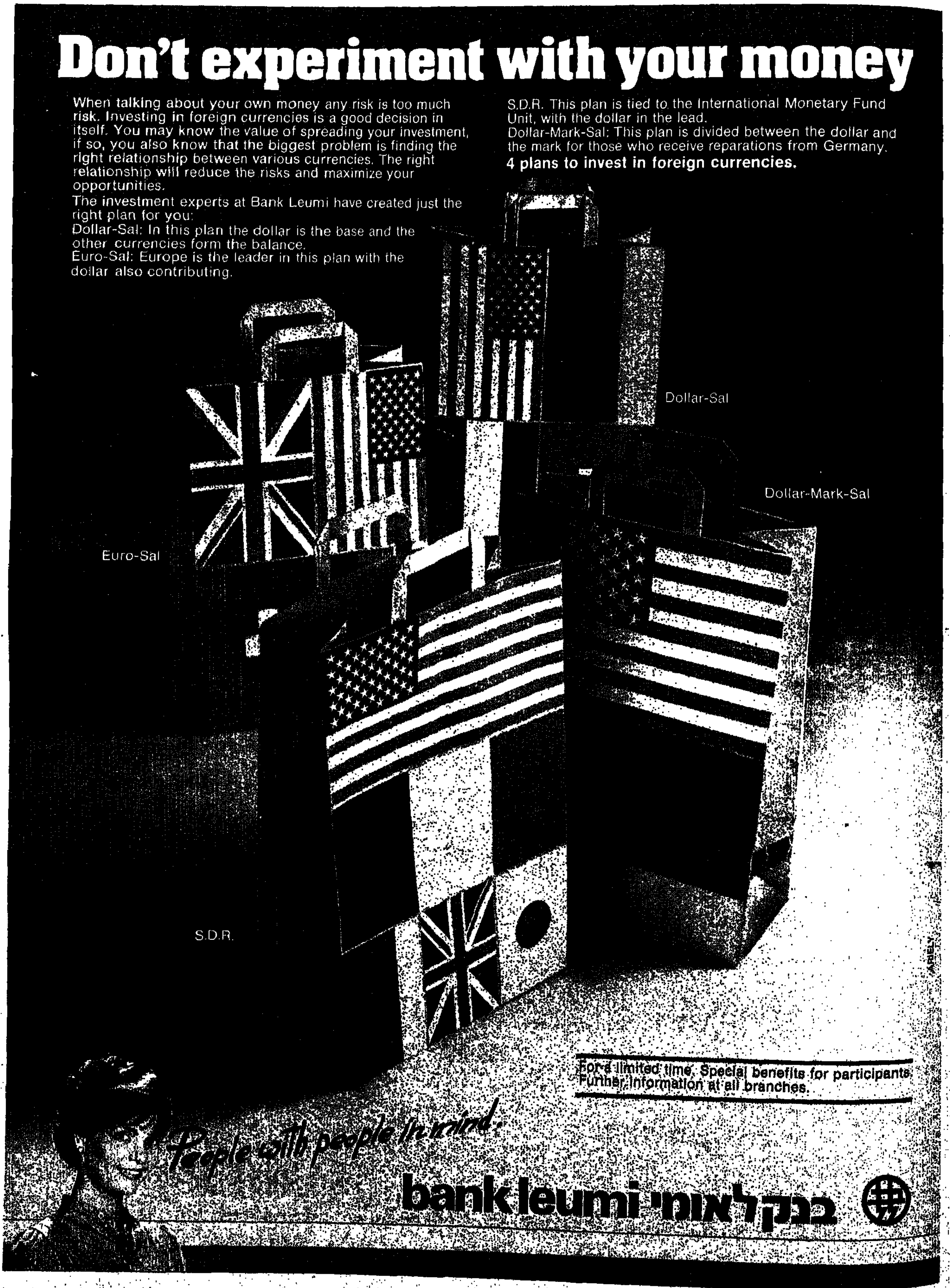
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THE JERUSALEM
POST
Supplement

Thursday, July 29, 1982

Science-based industries

هكذا في الأصل

High technology and economic independence

The application of an already high level of scientific know-how to industrial production provides Israel with the best chance to cure its chronic financial problems. The Post's JOSEPH MORGENSTERN reports.

AN OUTSTANDING EXAMPLE of the high level of technology which has been achieved in Israel can be seen in the Israel Defence Ministry's decision to go ahead with the development and construction of the Lavic fighter plane. It is a massive project requiring a high level of technology, engineering skill, as well as highly trained production personnel. Development costs alone are expected to exceed $1b.

Airplane industry analysts point out that the costs of building an Israeli fighter plane will be no greater than buying an American-built fighter plane.

But the Lavie project, besides saving badly needed foreign currency, will provide some 18,000 jobs. And it is estimated, billions of dollars will be added to the gross national product over the next 20 years.

It is anticipated that the first prototype of the Lavie will be ready by 1985 and that delivery to the Israel Air Force will begin by 1990. Marketing research has also revealed the tantalizing prospect of a potential market for 300 planes in the U.S. alone.

Elbit Ltd., of Haifa, a subsidiary of Elron Electronic Industries, is expected to be one of the major beneficiaries of the project. Uziah Galil, president of Elron, has expressed the hope that as a result of projects like the Lavie — as well as by the further rapid growth of Israel's high-technology industries — Israel will become attractive to the many highly trained and skilled Israelis now in the U.S. .

Furthermore, by providing job opportunities in such stimulating fields as electronics and other high-technology sectors, there are hopes of developing a whole new cadre of Israeli-trained technicians and scientists. These, in turn, will find employment in the creative areas of high-technology industries, which are Israel's best hope of reducing its perennial balance of payments deficit and its foreign debt.

Leaders of high-technology industries in Israel also agree that this area of activity offers Israel its best hope for economic independence and for the further development of its most valuable natural resource — its brainpower.

IN THE EARLY years of the state, Israel's brain power was channelled into fundamental research and development. Following the Six Day War, it became clear that Israel would have to look increasingly towards its own industry for some of its most vital defence needs.

This realization marked the beginning of the founding of what is commonly referred to as Israel's science-based industries.

Among the names of those in the vanguard of the movement to establish science-based industries was Dan Telkofsky, who persuaded his colleagues at Discount Investment to provide "seed money" for such concerns as Elscint, Elbit and Elron industries. Management leadership was provided by Dr. Avraham Suhami, Uziah Galil and Moshe Baron of M.G. Medical.

Somewhat later came Efi Arazi, who founded Scitex. All these individuals possess the skills which are necessary to establish successful industries. And they brought with them a wealth of valuable experience and a touch of entrepreneurial daring.

SINCE THE 1970s, the development of science-based industries has become a national goal. The basis for these industries has been firmly established and today Israel is Number One in the world in the percentage of population involved in research. Indeed, three out of every 1,000 Israelis are engaged in full-time research and development activity. The U.S. is in second place with 2.5, followed by Japan with 2.4. Sweden and Switzerland follow, with 1.7 each.

Israel has also achieved a high rank among the world's leaders in the percentage of the gross national product which is devoted to research and development. Israel and Switzerland both spend 2.3 per cent of their gross national product on research and development. Britain is the only nation with a higher percentage.

The intensification of research and development has had a very positive impact on Israeli industry, which last year exported well over $1b. worth of products which were the direct result of local research and development. This represented nearly one-third of all industrial exports.

Government assists industry in its research and development programmes: "Experience shows that for every dollar invested in industrial research and development, we may expect some $8 to $10 worth of exports of locally developed products," says Professor Arie Lavie, chief scientist of the Ministry of Trade and Industry, which is in charge of allocation of government funds to industry.

Approximately 500 firms are currently active in research and development projects. Six years ago, the figure was in the order of 200 companies. Nearly 100 new research and development-based companies are formed each year. Academic manpower active in research and development is rising at an annual rate of almost 16 per cent and includes 6,500 academics, engineers and technicians and 4,500 other employees.

SCIENCE-BASED industries abroad, have been duly impressed with the value of Israeli research and development. Many have invested in local industry and have established subsidiaries or have engaged in joint production.

In the electronics field alone, a partial listing of foreign companies active in Israel includes Control Data Corporation, General Telephone and Electronics Corporation, Gerber Scientific Instrument Company, Intel Corporation, International Business Machines, Itek Corporation, Itel Corporation, Mennen-Greatbatch Electronics Inc., Microwave Associates, Motorola Incorporated, National Semiconductor Corporation, Vishay Intertechnology Inc. and Zenith Trading Corporation.

To encourage overseas investments, the government has prepared an attractive incentive package. Financial incentives include cash grants and loans of up to 75 per cent of the investment in fixed assets, low-interest loans to finance working capital, dollar for dollar government cost-sharing in approved research-and-development projects and grants to share in the cost of training personnel. Among the tax incentives is an accelerated depreciation schedule, whereby new industrial machinery and equipment can be depreciated within two years, and buildings within five years.

There is also exemption from income tax during the first five-year period and only 30 per cent corporation tax. In addition, tax-deductible equity maintenance allowance is extended to protect foreign investors against inflation and devaluation.

Profit and principals can be freely repatriated in foreign currency. There is no limit on foreign ownership.

OVER THE PAST 15 years, closer links have been forged between Israeli industry and the country's institutes of higher learning. All universities operate specialized research-and-development authorities which encourage applied research on the part of their scientific staff and subsequently assist in the commercialization of their findings.

It has become increasingly common for these research-and-development authorities to enter into joint ventures with outside production and marketing companies, both local and foreign.

While trying to create interest overseas in investing in Israel's science-based industries, further impetus is being given to this development. A prime example is the proposed new Science and Industry City in the Galilee. The concept behind such a city is to exploit and commercialize Israel's brainpower by preparing an environment for its concentration and culture in Israel and promoting Israel into a post-industrial economy by giving impetus to the development of applied science, information technology, industry and research and development.

Among the main objectives of the concept is to attract Israeli, American and other overseas entrepreneurs to develop high-technology and research-oriented industries.

Such a community will have the potential of becoming a major centre with international standing in such specialized areas as education, medical technology, biotechnologies, communications, information and related support industries.

Energy saver

IN THESE DAYS of soaring energy costs, the efficient use of fuel and electricity is becoming increasingly important. This is especially so for large institutions — industrial plants, and hotel and office complexes — where wastage can involve huge amounts of money.

Yet because of the complexity of such institutions it is often difficult to reduce this waste by conventional means.

The basic problem is that of the monitoring and management of a diverse network of varied energy-using devices so that, as a whole, they work together at an optional level.

At the end of last year, Motorola Israel Ltd. introduced an elegant system which promises to eliminate many of the problems associated with energy waste, as well as perform other functions. Called the MEIC 3000 Energy Controller, it is based on a computer that "knows" when savings can be made by adjusting networks or switching them on or off.

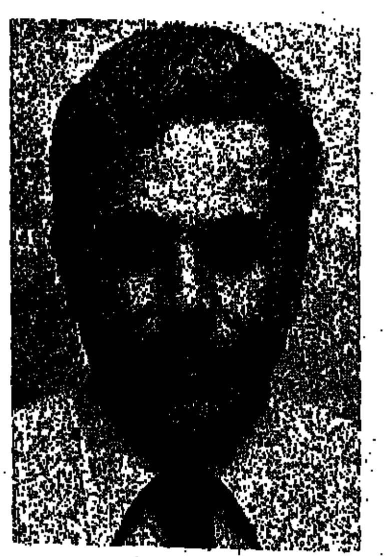
So far, 15 systems have been sold in Israel, 10 of which are already in full operation. Clients include the Tel Aviv Sheraton Hotel, the Clal Centre in Jerusalem, the El Al building, Kibbutz Hamadiah and others.

THE MEIC 3000 consists of a computer-based control centre linked to all the energy-using units in the building or plant. The control centre receives information on what is happening in each unit and sends back operating commands to the units. The information and commands are carried through a single two-wire electric cord by means of digital pulses.

Integrated into the computer module is the operator's keyboard and display screen. Operating procedures are simple and an average worker could be taught to run the system in an hour. The MEIC 3000 can be worked manually by the operator, or it can be programmed to automatically carry out various functions.

For example, it can switch on or off specified lights, heaters, coolers, ovens and other appliances at various times of the day and night, according to its instructions. Or it can be used to monitor and adjust sensitive systems, and to page a maintenance officer if there is a malfunction. The programme can be changed at will by the operator.

The device also has a print-out facility which can record what is happening in the network. This may be used for producing daily, weekly or monthly (or any other period) reports of energy usage and activity in all the sections of the network. Such reports could constitute a powerful tool for the analysis and planning of operating procedures.


Aharon Sorek

The system can control up to 63 distributed units along the cord and this capacity can be easily enlarged by adding extra components.

ONE OF THE more sophisticated uses of the MEIC 3000 is in the control of an institution's peak demand for power. For example, a particular hotel may under normal conditions have three boilers in operation and another two standing idle. On certain occasions, the need will arise to operate all five boilers simultaneously, which would raise the hotel's demand for electricity temporarily above the usual value to a much higher peak.

Power supply corporations make huge investments in resources so that they can accommodate such extra demands, and they charge clients according to the value of their maximum peaks. Thus, to avoid paying a higher tariff, it is in the hotel's interests to keep the maximum peak at its normal lower value. This may be done by switching off certain other appliances while the extra boilers are on.

Normally in a large plant this would be a difficult operation to coordinate, especially if the extra boilers come on automatically. But with the MEIC it becomes feasible. The computer is simply programmed to automatically switch off various preselected appliances whenever the plant's electricity demand rises above a certain level, and to switch these appliances back on when the demand falls again.

Aharon Sorek, the assistant general manager of Motorola Israel, is enthusiastic about his company's newest product.

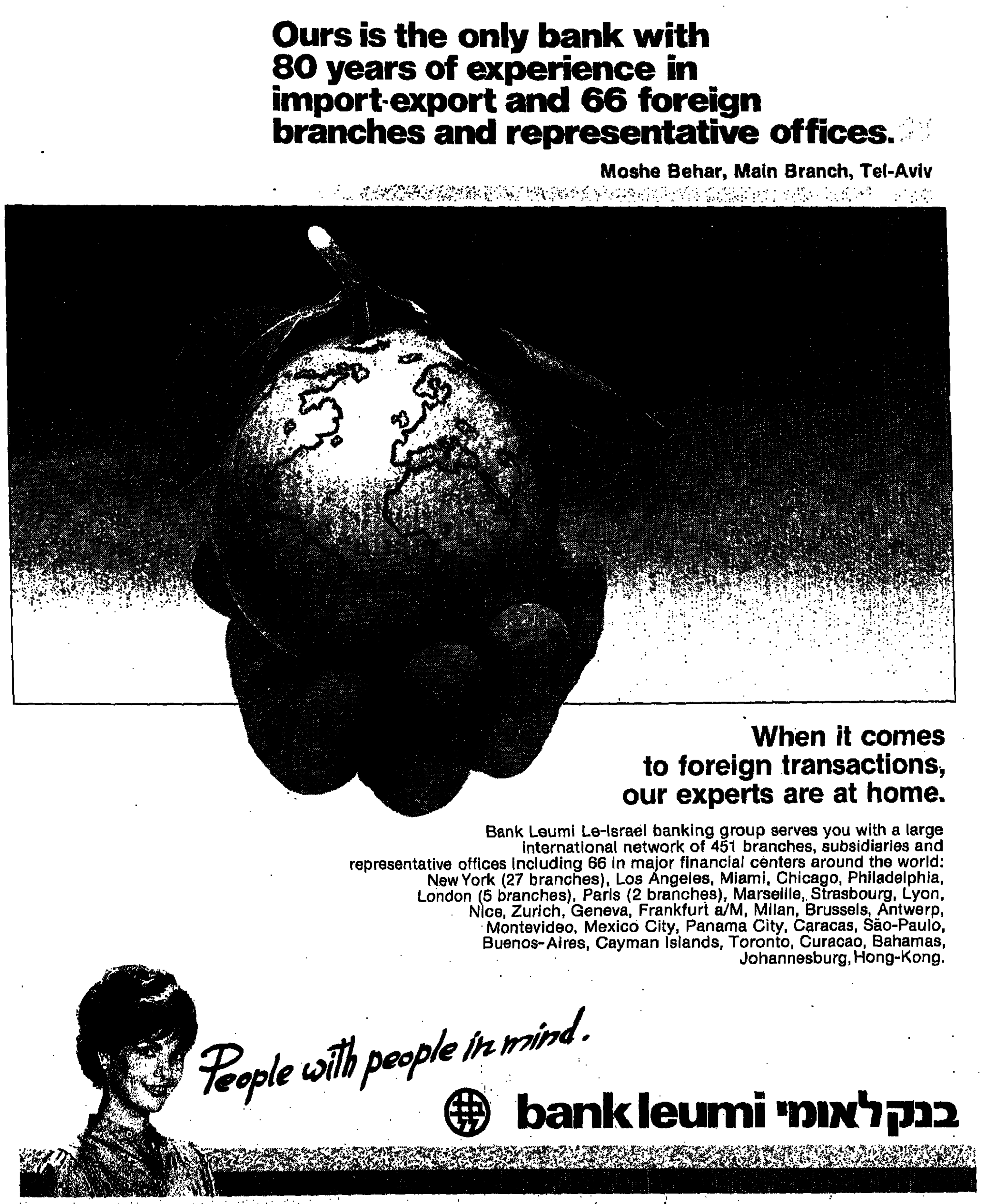
"Motorola Israel has always thrived on the special conditions of the country" he says. "The highly skilled population provides us with nearly all our personnel, and the particular problems of Israel provide a thrust for creative development. Israel is our laboratory.

"In the early years of the state we concentrated on wireless communications equipment and supplied most of such equipment for both the army and the private markets. Then in the 1960s the water shortage problem and the Arab attacks on farmers in their outlying fields led us into the area of remote-controlled irrigation systems.

"Today we provide 90 per cent of the remote-and computer-controlled irrigation equipment in the country. And we are selling our systems with great success all over the world.

"Now we are entering a new phase with our energy-control systems, which will give large energy-users greatly enhanced control over their networks."

Geoff Sti[illegible]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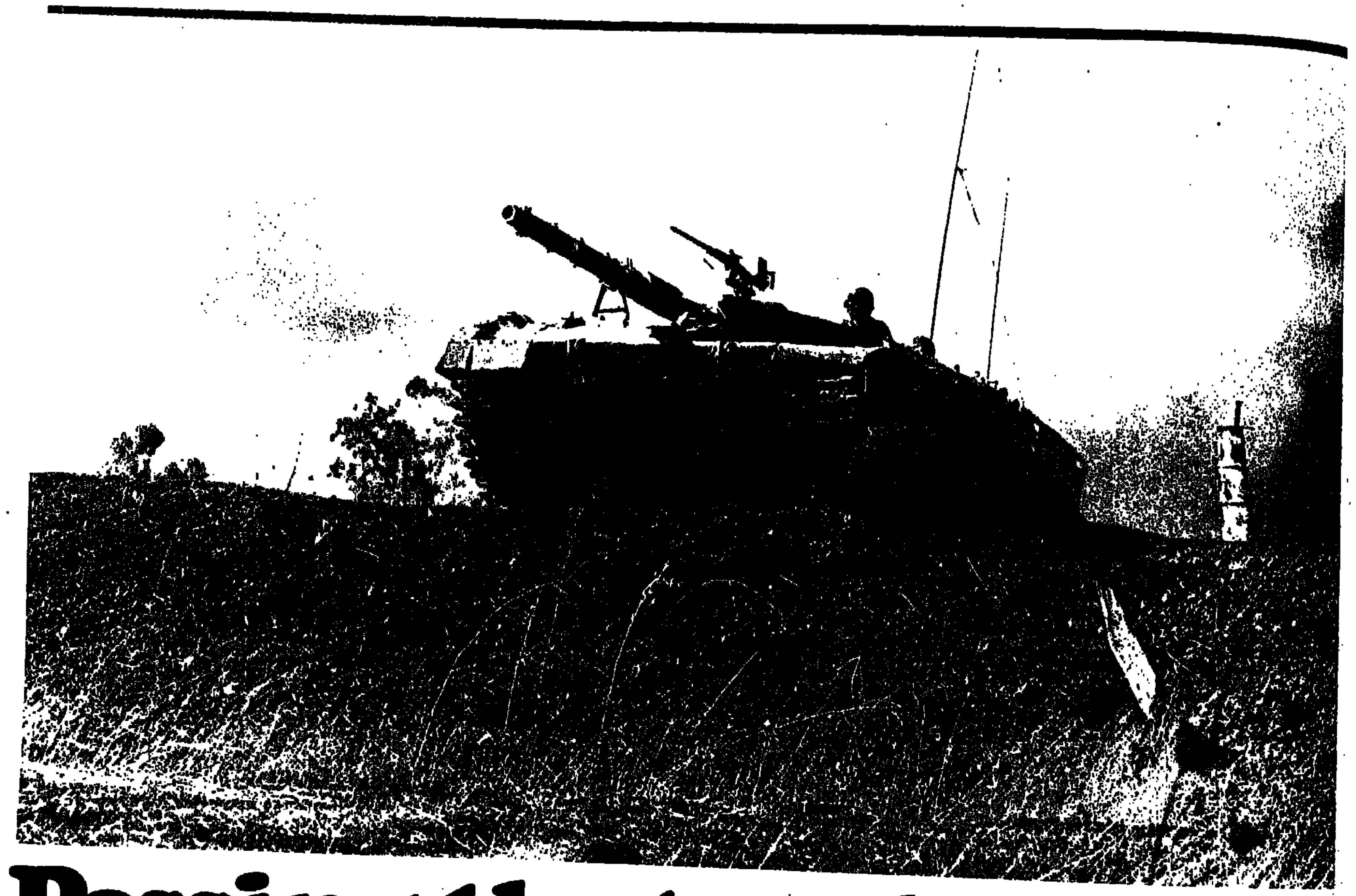


Passing the toughest test

Due credit for Israel's success in the war in Lebanon must be given to military technology, which solved many of the problems discovered on the battlefields of 1973.

AFTER THE Yom Kippur War, commentators pronounced the dawning of a new age of warfare in the Middle East. Arab successes in using precision-guided missiles against Israel's air force were undeniable. Some forecasters announced that Israel's dominance of the skies had been neutralized.

Further, precision-guided munitions had shown themselves highly effective against tanks. And the Soviets, the Arabs' chief weapons supplier, had developed a new tank, the T-72, with tremendous armour capabilities. It was rumoured that this tank could tip the balance, not only in the Middle East, but in Europe as well, in the favour of the Soviet Union and its clients.

Clearly, the commentators concluded, the battlefield had been transformed, with Israel's qualitative superiority in question.

This uncertainty about the Jewish state's defensive capacities held for almost a decade, until Israel decided the time had come to remove the terrorist threat to its north. Within days, it was clear that the prophets' of doom had been wrong. It was clear that there had been no reason to belittle the strength of the technology backing up the IDF.

OBVIOUSLY, the whole story cannot yet be told, but enough is already known to indicate technology's role. A few examples will illustrate.

The Israeli Air Force reportedly downed 86 of Syria's Migs and destroyed about 20 SAM surface-to-air missile batteries, heretofore thought invincible.

Newsweek quoted Western military experts when it stated: "Israel used a sophisticated electronic one-two punch to knock out Syria's surface-to-air missile batteries in the Bekaa valley... The Israelis first sent a drone — a small pilotless aircraft — to detect the radio frequency the site was using for missile guidance. A second drone followed, equipped with a high-explosive warhead and a device that enabled it to home in on its target precisely by guiding itself along the site's own radar beam."

Israeli sources have not confirmed this version of the method used to neutralize the missiles. Sources in the Defence Ministry, say that it would be the first time that drones had ever been used in active combat. But, whatever method was used, the fact remains: the missile batteries were destroyed without the loss of a single Israeli plane.

The second myth of the last decade was destroyed in the war's tank battles. Israel's home-built Merkava, using what *Newsweek* said was a new hollow-charge missile of Israeli design, proved superior, but this too was not confirmed.

THE TECHNOLOGICAL developments that led to these, and other, battlefield achievements are a result of the seriousness with which technology has always been taken in Israel. Despite the country's small size, Israeli technology is rated among the best in the world.

Long before the establishment of the state, the country's founders saw the importance of the subject. The first institute of higher education to be established, even before Wrold War I, was the Technion-Israel Institute of Technology. From this institution came engineers to work both in building the country and in strengthening its defences.

Today, some two thirds of the engineers at work in Israel are Technion graduates. Others have immigrated from both Eastern and Western bloc countries. The supply of engineering talent has been supplemented by newer programmes in other Israeli universities.

The existence of this pool of trained manpower made it possible to aim for a high degree of self-reliance in the production of the country's defence needs. Combined with geopolitical realities — embargoes and suspended deliveries of airplanes, missile boats, and other vital items — this self-reliance became imperative. Efforts in this direction picked up steam in the late 1960's.

The results were seen in Operation Peace for Galilee. Technological and industrial skills, combined with field experience, led to the successful production of sophisticated weaponry and 'total weapons systems,' including the Merkava tank, based on a revolutionary new concept, the Kfir jet fighter, the Reshef missile gunboat, the Gabriel naval surface-to-surface missile, and many other items.

This engineering progress could be seen in the air, on the ground and at sea, where the lessons of the Yom Kippur War had been carefully analyzed and operative conclusions drawn.

Dozens of new technological developments were used, and stood the test, during Operation Peace for Galilee.

Among those developments were computerized control systems for tank guns improved night-vision equipment advanced communications systems, RPVs' improved ammunition of all kinds, both in accuracy and final ballistic effectiveness.

A WIDE RANGE of Israel industries took part in the effort to build a strong, technologically based defence for Israel, Rafael, the armaments development authority, originally established as a technical unit within the Israel Defence Forces, became a civil authority in 1960. The authority has developed many weapon systems, especially in the field of guided missiles. The Shafrir is the most famous of these, with a hit ratio of over 60 per cent. The firm has also employed advanced computer technology in developing the David field artillery computer, and Mahat, a lightweight weapon-delivery computer which greatly aids pilots' accuracy.

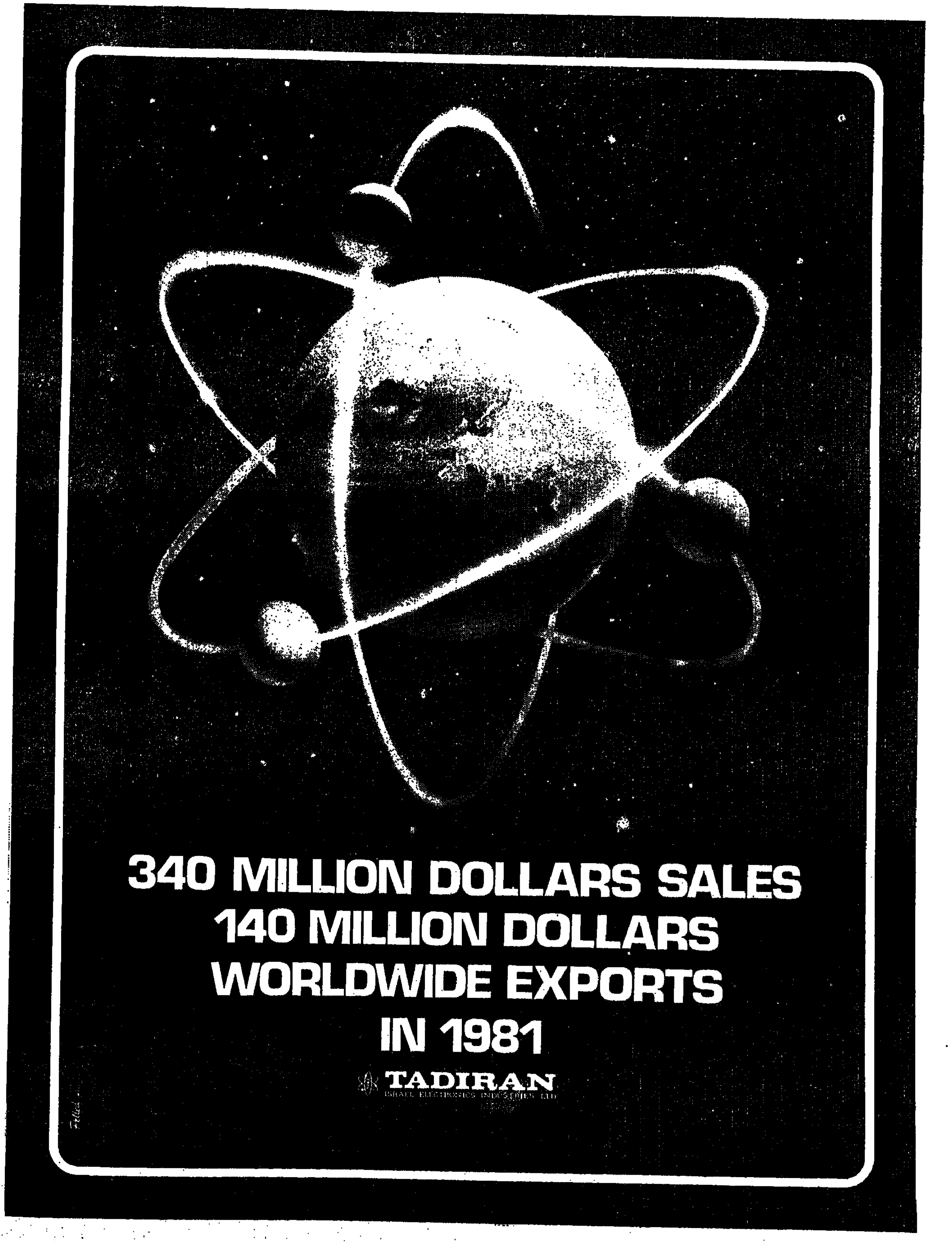
A score of other science or technology-based industries also played a role — including Elbit, which develops and produces weapons delivery and navigation systems; Iscar Blades, manufacturer of jet engine compressor and turbine blades; A.E.L., specializing in electronic warfare equipment; and, of course, the Israel Aircraft Industries and the Israel Military Industries.

In the final analysis, Israel's defence depends on the ability and valour of her soldiers. But Israel, with its highly trained technological manpower and well-developed industrial infrastructure, must ensure that the men have in their hands the best, most advanced weaponry.

New lessons have been learned from the war in Lebanon. These will also be applied to ensure that Israel, though quantitatively smaller than its enemies, will remain qualitatively stronger. On this depends the country's defence and its survival.

Paul Hirschhorn

The author is senior staff writer at the Technion-Israel Institute of Technology.



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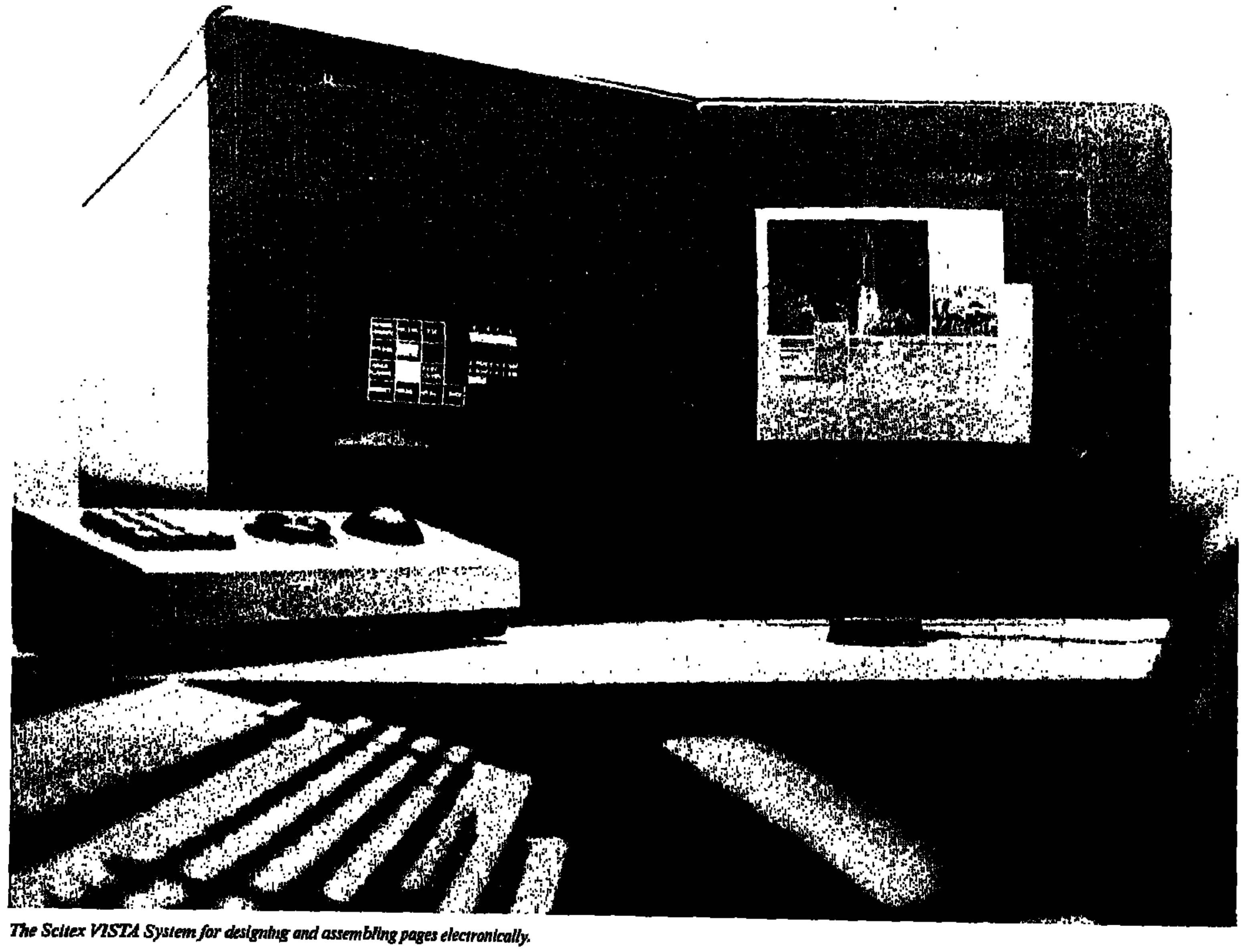

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Light industry

An Israeli firm is at the cutting edge of new development in the medical and industrial application of laser technology.

LASER INDUSTRIES LTD. is the acknowledged world leader in the development and manufacture of carbon dioxide surgical laser systems.

The word "laser" stands for "light amplification by stimulated emission of radion." A laser is a device which is capable of emitting a "coherent" beam of light essentially of a single wavelength and uniform direction. This property permits the focusing of light to small areas with exceptionally high density of power and energy at the point of focus.

As a result, a laser of proper wavelength may be used, among other things, as a surgical device for cutting and vaporization of tissues and for coagulation.

The laser industry is approximately 20 years old. While research and development activities in laser technology are proceeding in the scientific, military, industrial, medical and surgical areas, the company has concentrated its efforts to date on surgical applications.

Surgical and medical laser units are generally categorized by the "active medium" employed, that is the basic material used in the production of the laser's energy beam. Surgical and medical lasers may employ gases, such as carbon dioxide or argon, or crystals such as yttrium-aluminium-garnet (YAG), or ruby crystals.

The active medium and operational mode determine the tasks lasers are best able to perform; and, in general, different kinds of lasers are not interchangeable with respect to any particular applications.

By way of illustration, lasers employing an argon or ruby crystal medium are effective for treatment of detached retinas and in other eye procedures, but cannot be used to cut body tissues effectively.

In developing its products, the company has decided to concentrate on carbon dioxide lasers emitting an infra-red beam with a wavelength of 10.6 micrometers. For surgical applications, the capacity of body tissues to absorb this wavelength safely allows the effective use of the carbon dioxide laser as a tissue-cutting or tissue-vaporizing instrument, while substantially reducing blood loss and the risk of infection by sealing both blood and lymph vessels in the adjacent tissue.

The company's units employ visible helium-neon laser beams as a guiding aid for surgery by the invisible carbon dioxide laser. In the company's carbon dioxide laser, a gas mixture, containing carbon dioxide as the active element, is continually pumped through the laser tube where the beam is generated.

THE PRINCIPAL areas in which carbon dioxide laser surgery has been successfully applied include ear, nose and throat surgery, gynecology, dermatology, neurosurgery, general surgery, burns, head and neck surgery and plastic and reconstructive surgery.

As laser instruments do not require direct physical contact with the body (except for the action of the beam itself), a number of very delicate procedures in neurosurgery can be performed only by means of the laser, such as the removal of tumors from sensitive brain areas.

In addition, accurate access to more remote body areas can be gained by means of laser accessories, such as mirrors and lenses, tubes and endoscopic attachments, thereby permitting surgical procedures without cutting through or opening up healthy tissue in order to reach the diseased area.

The Sharplan surgical units incorporate spot sizes as small as one-tenth of a millimetre in diameter to provide pinpoint precision; an articulated arm for freehand operation which allows superior maneuverability; a mechanical micro-manipulator providing rapid change and quick adaptability from freehand to microsurgery; a helium-neon beam aiming system allowing for proper guidance of the invisible carbon dioxide laser beam; a sharp and highly precise optical beam shape for focusing control; a control panel including an electronic fault display system and automatic shutdown; and up to four modes of laser operations — continuous, single pulse, repeated and super pulse.

THE COMPANY markets two basic models of surgical lasers; the Sharplan 743 and 733. The Sharplan 743 and 733 units are sold to hospitals for use in operating rooms.

In 1982, the company began production of the Sharplan 723 and 720 models, both of which are smaller mobile units designed for gynecological and dermatological procedures in doctors' offices and out-patient clinics. Both the 723 and the 720 have maximum power of 25 watts and are expected to be priced at $25,000 and up.

The company has recently developed and introduced a new range of laser endoscopic attachments for use with carbon dioxide surgical laser systems. These attachments, designed for bronchoscopic and gynecological procedures, are undergoing clinical evaluation and final design refinement. They are expected to be brought to the market this year at prices ranging from $2,000 to $6,000. Other accessories currently in production include hand pieces, micro-manipulators and smoke evacuators.

All the company's research and development laboratories and executive offices are located in fully airconditioned facilities in two adjacent buildings at the Atidim Science-based Industrial Park, Neve Sharett, Tel Aviv. The company's manufacturing and assembly operations have been relocated to a facility in nearby Petah Tikvah.

Each Sharplan system is fabricated by Laser from over 3,000 parts, of which about two-thirds consist of commercially available industrial parts and the remainder are designed and manufactured to the company's specifications.

The parts are primarily imported from manufacturers in the United States or manufactured by smaller companies in Israel, which, in many cases, are single suppliers.

Since the quantity of parts the company requires has been expanding rapidly, the company is presently looking for alternate sources of supply for many of the parts. No single supplier provides more than 10 per cent of the parts required by the company for its production. Due to the sophisticated nature of certain materials and components, they must be ordered in advance and there is a lead time of six to eight months for each production run.

Each model is designed for interchangeability of its sub-assemblies, which include the power supply, the laser head and the beam delivery system (including mirrors and end-pieces).

All systems are assembled in-house and are individually tested with sufficient running-in time devoted to each system to provide a high standard of performance. The company's work force is trained in all production and assembly operations (except electronics), which facilitates production-line balancing.

The company has 12 engineers and technicians working full-time in quality control. These engineers test all components before they enter the parts inventory and continuously engage in testing during all stages of production. Final quality-control tests include a running-in period, where the performance of each unit is recorded independently and a final inspection at the packing stage.

The company is currently covered on all its surgical laser systems with product liability insurance for up to $3m. in the aggregate. It has never received any product liability claims.

In the United States, the company sells its products exclusively through its subsidiary, Advanced Surgical Technologies Inc. Before July 10, 1981, ASTI was Laser's exclusive, independent distributor in the U.S. On that date, the company acquired an 85 per cent interest in ASTI.

THE FIRST industrial application of a laser took place in 1980 when it was discovered that a beam from a laser could make perforations in diamonds. Subsequent developments and improvements in their design and engineering allowed for the adaptation of lasers as production tools. Though there are many types of lasers, there is no doubt that the carbon dioxide laser is the most appropriate one in the field of metal working. High-power carbon dioxide lasers were initially adapted for commercial applications in the early 1970s.

There is no longer any doubt that the unique advantages of lasers allow them to be effective and cost-competitive alternatives to other conventional processes with similar applications. One of these advantages is that the heat added to the material for a given process with a laser is materially less than the heat added to perform the same operation by a conventional process. As a result, distortion of parts is effectively reduced.

In 1979, Laser Industries together with two American companies, Locke Technology, Inc. and Sciaky Bros. Inc., have established a joint venture company Metalworking Lasers International (IL) Ltd. MLI undertook in 1980 to carry out an intensive industrial laser research and development programme aimed at developing an industrial laser to participate in what the company believes to be a major and exciting new market for carbon dioxide lasers. MLI, with its 27 engineers and scientists, has been making rapid strides and at its current stage of progress it is anticipated that commercial production will begin sometime next year.

J. Morgenstern

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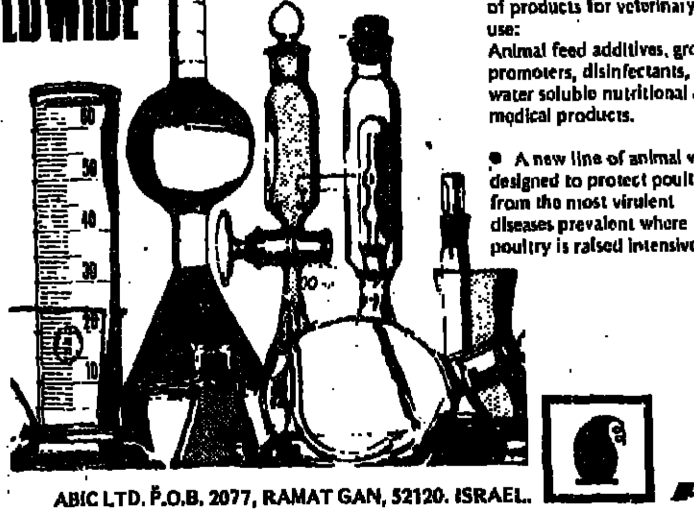
- 90% of Abic's exports are based on innovations: 50% of Abic's sales are exported.

Of 110 patents registered by the Israeli pharmaceutical industry over 20 years — 57 have come from Abic, and hundreds of extensions of these patents have been registered worldwide.



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ABIC LTD.

Technology in the service of medicine

by Meira Shacham

They hardly stand out in a crowd. Watching them joking and laughing while playing with their children, hurrying to avoid being late for a class or hard at work on the job, one is barely aware they use artificial limbs.

They may be soldiers wounded in war, victims of car accidents or part of a growing number of persons injured working with the sophisticated machinery of modern industry. Not long ago their very chances of survival were slim.

But because of recent improvements in surgical techniques, these people are being saved. The price they pay is the loss of limbs. They gain their lives.

Every war has caused a drastic increase in the number of war veteran amputees in Israel. Once saved they must be treated, and the very success of medical research has created new problems for scientists to solve.

The Rehabilitation Engineering Laboratory at the Technion's Department of Biomedical Engineering was founded three years ago. Its main objective is research and develoment that is clinically applicable. Most of the lab's research deals with leg and hand prostheses and the researchers have at their disposal the most technologically advanced equipment. Among their projects: control of an artificial knee mechanism through adaptation or by micro-computer, and clinical assessment of pathological gait. Beyond such basic activity, the researchers have taken upon themselves projects to aid disabled people whom they meet during their work.

The Technion team has built close working relationships with all the main rehabilitation hospitals in the country. This affords them the possibility of helping to solve immediate and pressing problems connected with their particular area of research. They become part of the rehabilitation team in various clinics and are consulted regularly on unusual aspects regarding the engineering angle of a patient's problem.

Merging with Society

The successful rehabilitation of a disabled person depends largely on his ability to merge with society, and contribute to it within the limitations of his disability. It also depends on society's acceptance of him as an equal member. To that end, his physical performance must be improved. In the case of people whose natural communication ,system malfunctions, ways and means have to be developed to restore that system, at least partially.

The lab's researchers have found that there are many problems in which the help of conventional, commercial aids are quite useless, sometimes due to the uniqueness of the problem. Sometimes the problem is the absence of an established centre where the highly technical know-how can be put to use. Developing instruments demands great ingenuity, creativity and a strong motivation to help. This area of research is known as ADL — Aids to Daily Living.

Many of those suffering physical trauma are young. They need a different, higher performance artificial limb. In Israel, the majority of traumatic amputees are those suffering war-related injuries, and they require artificial limbs that will enable them to live normal, productive lives. Research in Israel related to war injuries has wide application for other traumatic amputees throughout the world.

The Surface Science Laboratory in the Technion Solid State Institute is the only one of its kind in Israel. It conducts research in surface physics, chemistry and material sciences and performs surface analysis in a number of related areas. Apart from its own research activities, the laboratory provides essential services for a large number of industries and research institutions in the country which specialize in a wide range of areas such as metallurgy, microelectronics, high polymers, catalysts, corrosions and others.

Twist drill life greatly extended

An innovative drill point grinder that increases the life of twist drills up to three times has been developed by researchers in the Technion Faculty of Mechanical Engineering.

"In each of the commercially manufactured drills we tested, large scatter in performance was observed," explained Professor Ehud Lenz. "Commercial drill points fail to achieve greater tool life, because of deficiencies in the geometry employed in their design and grinding. By our research, we have corrected these deficiencies."

A research team, including Professor Lenz and Dr. Samuel Keldor, has developed fundamental mathematical definitions for the design of improved drill point grinders.

A point grinder has been developed in the laboratory in order to produce drill points for test purposes, using the geometrical model developed by the researchers.

An improvement in tool life by a factor of about 2.5 was achieved by points with the new geometry, compared with conventionally ground drill points.

Technion—the key to Israel economic independence and security

As Israel's technological university, Technion plays a crucial role in the economy's growth today, and will for years to come. Three quarters of Israel's applied scientists and engineers are Technion graduates. Their skills are the essential component in the development of high-technology-based industries, which will enable Israel to be competitive in the growing international market.

By mining these human resources, Israel can expand beyond its traditional dependence upon export of agricultural products, cut diamonds and tourism. She has already begun to export data processing equipment, weapons, CAT scanners for medical diagnosis in hospitals, microcomputers to control machine tools, CO_2 lasers for bloodless surgery and fiberoptics for communication. By placing a special emphasis on R&D (research and development) in industry, Israel has enhanced its reputation for advancing technological processes. Technion research has played an essential part in this effort. Israel's economic and defence needs of the 1980s are dictated by current events. She will continue to bear the high cost of peace with Egypt. Israel gave up a major source of oil as well as several development towns in exchange fo the same time, Israel m complex and expensi establishment, the e which have exci expectations in the h Galilee campaign.

More than ever, security depends upo and technological tale Technion replenishe supply of engineers a scientists, just as it was of these people more th century ago, when it be State's first institution learning.

A stronger Technion stronger Israel.

Technion president calls on government to promote scientific and technological studies

Technion President Major-General (Res.) Amos Horev recently called on the Ministry of Education and Culture and all others in the State "who are interested in maintaining Israel's scientific and technological supremacy and in promoting industrial growth to make sure that the best of our young people, those with talent and inclination in scientific and technological studies, be afforded encouragement and incentive in their preparations for their careers."

This call serves to underscore the role of high technology in the current Peace for Galilee Campaign. The accomplishments of the military today bring out vividly the necessity to remain prepared in the future. The foundation on which such supremacy is based is, and will always be, the opportunity to receive an advanced education in the sciences.

Noting the importance of higher education for Israel, Horev took as his example the great advances Israel has made the area of science-based industries.

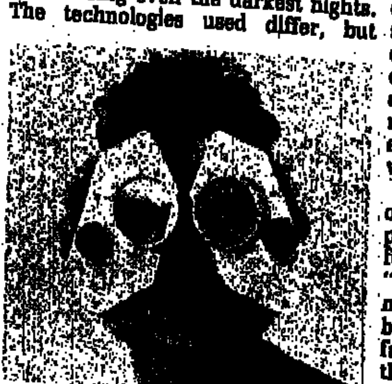
"No survey of Israel today can fail to take note of the burgeoning of the whole field of science-based industries, not only pioneering in new areas but also successfully challenging the supremacy of the great powers in certain specialized fields" said Horev. "There is little doubt that Israel's achievements are due not merely to what some chauvinistically choose to call 'the Jewish brain' but also to an educational framework which is able to sharpen intellectual talents and to tap latent abilities. The educational system is capped by our complex of institutions of higher learning, an honourable assembly in which the Technion holds historical seniority."

Improved optics for night vision instruments

A substantial improvement in the visual display of starlight scopes (SLS), infrared viewing devices and similar night viewing equipment will result from innovative re-design by Dr. Itzhak Hadani of Technion's Department of Biomedical Engineering.

The new instruments eliminate or greatly reduce problems of headaches, nausea, and dizziness that commonly arise in the use of such devices.

Various optical instruments permit the continuous observation of a given area during even the darkest nights. The technologies used differ, but usually the observer dons a pair of binoculars which do not enlarge the image, but rather allow him to see what goes on in front of him in the dark.



The use of such equipment involves certain difficulties because the objective lens is located a considerable distance — 10 or even 15 cm. in front of the viewer's eyes. This makes little difference when he directs his gaze at a static object, but causes some problems when he wants to sweep over the scene. In that case, there are almost invariably problems of motor coordination and of visual stability; space perception is usually distorted and the size of objects cannot be estimated with any degree of reliability. The latter effect can result in serious accidents, when such equipment is used by drivers of motor vehicles.

Dr. Hadani's invention eliminates or reduces these negative physiological effects, through fundamental re-design, taking the "human factor" into account. In the new instrument, the objective lens is brought much closer to the eye — a fact which also reduces demands on the photointensifier tube and leads to reduction in component costs.

The fu engine

by Harvey Brow

The push to develop Isr high-performance comba started at the close of the Day War. The French Gov surprise embargo on the d fifty paid-for Mirage IIIC p Israelis into the realization would have to become the supplier of sopisticated hardware. Defence expe wondering whether Isr capable of building a comb could compete with the made F-4 Phantom and th produced Mirage IIIC. Ba Israel Aircraft Industries them it could be done.

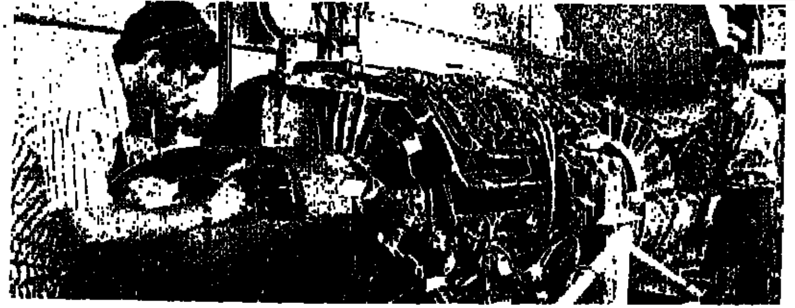
That they succeeded in the history.

But in order to make p economically viable, it was for the IAI to sell the pla Again, outside forces playe role, because the Kfir's engi American design. Th Government exercised its sales.

Today Israel is at wor ie, the next generation aircraft to low the Kfir. Under careful sideration also is an Israeli-igned turbo-jet engine. The engine l be useful not only in military craft, but in civilian craft as well, d in helicopters, naval craft, trains, vy-duty trucks, and earth-moving ipment.

Gas turbine is the "family name" all these turbo-jet engines. As gas bines replace diesel engines, they e on increasing importance for itary and civilian development. y conserve energy, use different ds of fuel, make less noise, are re efficient and operate at least ree times longer in hostile ironments. The U.S. military uses m not only for fighter aircraft, but cruise missiles, remotely piloted icles (RPVs), fast patrol boats and XM-1 tank.

The future engine will give a higher ust-to-weight ratio or greater sepower-to-weight ratio, using anced super-alloys. Some RPVs trucks will use ceramic blades combustors. Future land and ine turbine engines will continue



to be derivatives of aviation engines which, while usually developed for the military, can be the basis for civil advancement, too.

The need to develop our own jet engine has no simple solution. Professor Benjamin Gal-Or, Head of Technion's Turbo-Jet Engine Laboratory, says: "Difficult as it was to create the Kfir, the level of advanced technology necessary for an independently designed engine is many times greater. The expertise and infrastructure for advanced turbo-jet engines can be found in only a handful of the world's nations."

Only at Technion —

The Turbo-Jet Engine Laboratory is interdisciplinary in nature. Although a teaching and research unit in the Faculty of Aeronautical Engineering, it works closely with the Faculty of Mechanical Engineering and the Department of Materials Engineering. Only at Technion do these three faculties exist together in Israel. This places the Laboratory in a unique position. In research and development, the Laboratory is a partner of half-a-dozen industries throughout the country who participate in the manufacture of jet engines and their components. Thanks to the cumulative expertise of the Israel government and industry, turbo-jet engines are being built today in Israel. These companies include: Beit Shemesh Engines, Israel Aircraft Industry, T.A.T. — Aero Equipment Industry, Iscar Blades, Ormat Turbines, Koor Industries — Carmel Forge, and Cyclone Aviation Products.

But production of such an engine is different from designing it, of course. The manpower and infrastructure for the initial creative phase is currently minimal. Years of groundwork are required in research and development. Equally important, this work can be accomplished only by a cadre of scientists and engineers which has yet to be built up. In other words, graduate students at an advanced level should be enabled, now and in the future, to study turbo-jet engine design, modification and maintenance. The basic infrastructure already exists at the Technion; it needs only to be expanded.

Research in the Laboratory —

The Laboratory enjoys excellent relations with government and industry, both here and abroad. Currently, General Electric's Engine Division is spending over a quarter of a million dollars with the Laboratory for the development of engine dust separators for gas-turbine powered helicopters. The project is aimed at protecting the compressor and turbine blades from erosion and clogging by the dust stirred up during take-off and landing in desert areas. The semi-arid terrain in Israel is especially suited for this research.

Five other projects are being conducted in the Laboratory with the aid of engineers, technicians and graduate students. They include: the design of expendable jet engines for pilotless planes; plasma coating (mainly for ceramic materials and super-alloys) of hot components in the combustion chamber and after-burners of jet engines; and prediction of the deterioration rate of 747 Jumbo Jet engines, using a new methodology developed by the Technion Laboratory.

Yet the real meaning for such projects is for the future needs of Israel in turbo-jet engines. Any future engine to be developed in Israel must be ground tested, with simulations of altitude and speed. This requires advanced laboratories and qualified research teams. Israel has to create the necessary infrastructure. Government and industry are capable; they possess the know-how to launch such a project. Advanced laboratories already exist at the Technion that could assist in developing the jet engine and the gas turbine of the future. There is no reason to postpone the decision to go ahead with this difficult project. The fact is, Israelis are competent to determine their own future.

— Sponsored by th Institute of Technology

Expanding training acilities for engineers

by Aryeh Greenfield,

The continued growth of the Israel onomy, and more specifically of the untry's manufacturing industries, quires an adequate supply of gineering manpower. This country advancing rapidly into more and ore highly sophisticated areas of odern technology. To continue on at road, well trained personnel are eded.

The number of highly educated rofessionals in the economy must crease more rapidly than that of all dustrial employees. The traditional w technology industries — textiles, rment making, food processing, etc. - are growing less rapidly, while ore sophisticated fields of endeavour — chemicals, electronics, biotechnology — continue to increase their relative share of overall production. In the former categories, engineers number only about 1.5% of all employees; in the latter, they already constitute 7% of all staff.

The most reliable current estimates indicate that there are about 25,000 active engineers in the Israel economy, no more than 40% of them in industry. This last figure will increase significantly during the present decade,

A recent study by the government's Economic Planning Authority suggests there will be a total demand for as many as 50,000 graduate engineers in 1990. They will be employed first of all in the manufacturing industries, but also in the public services, in education, in agriculture, transportation and communications. Taking into consideration the number of people who will leave the labour force during this period, the necessary average addition is of the order of 3,000 engineers, during each year of the present decade.

In the past, Israel depended on immigration to cover a significant portion of its skilled manpower requirements. However, the growing demand for professionals in advanced fields of technology tends to dwarf that potential source of supply. In order to meet requirements in this sphere, it will be necessary to provide facilities for the education of a steadily growing number of engineers.

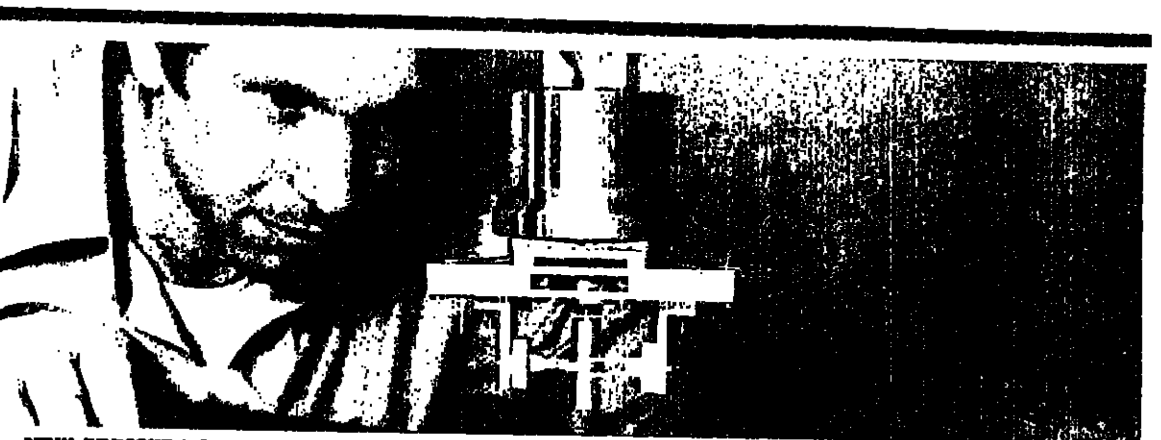
At the end of the 1970s, the country's institutions of higher education graduated about 1,500 engineers every year — perhaps one half of the number that will be needed annually between now and 1990. Fortunately, this will not necessitate the twofold expansion of all university facilities, since much infrastructure for such growth already exists. Nevertheless, substantial expansion will be needed.

Much of the needed growth will, undoubtedly, be supplied by the Technion, Israel's Institute of Technology.

In each of the last few years, about two thirds of all newly graduated engineers, and also of the new practical engineers in Israel were trained at the Technion. There is still room for additional expansion, at a relatively low cost, facilities now available making it possible to increase the number of Technion engineering graduates by perhaps as much as 50%, at the cost of only marginal additional expenditure. After that, however, further growth will necessitate substantial additional investments.

Aryeh Greenfield is Editor of INNOVATION, a monthly report on industrial R&D and science based industry in Israel.

Model of Technion-Israel gy, Technion City, Haifa. The 300-acre campus situated on the mel.



NEW PRESSURE-SENSITIVE ROBOT GRIPPER DEVELOPED AT TECHNION
An innovative new "gripper" for industrial robots, that makes it possible to use robots to work with extremely thin, cylindrical parts without causing damage, has been developed in the Robotics Laboratory of the Faculty of Mechanical Engineering.

Messages to the home front — the human side of technology

When the war broke out, word passed quickly to Israel's fighting forces. Thousands of Israelis dropped their everyday occupations and changed their civilian clothes for uniforms. Within hours they were at the front, often with no time to notify their families. If their kin were aware they had left, they waited, impatiently, for some word that their father, son, or brother was okay.

But many, if not most, of Israel's soldiers were unable to reach a telephone. Often under heavy fire, their priority was victory and survival, not sending messages home.

This left much of the population glued to their radios, waiting for word over the airwaves of Army Radio from their loved ones.

Mira Marcus, a graduate student in the Faculty of Industrial Engineering and Management at the Technion, came to the conclusion that it was impossible to listen for hours on end and that a lot of the broadcast messages probably did not reach their destinations. She came up with an idea and with it went to the Army Radio station. Mira proposed that the computer lists of the Ministry of Communications be utilized to track down the telephone numbers of all the families whose sons sent them greetings over the radio and that volunteers call them and personally convey the message. This way, Mira thought, most of the messages would reach their destination.

The idea was enthusiastically accepted by the Army Radio, and the Ministry of Communications readily provided the computer lists, recruited dozens of volunteers, set up a telephone centre next to the radio station, and provided the needed telephone lines.

Since then, up to 1500 telephone messages have been phoned to anxious families every day, many of whom had not heard from their loved ones since the outbreak of war. It also provides a personal touch .which is absent from the radio broadcasts.

Innovative oxygen monitor developed at the Technion

A completely innovative instrument, developed at the Technion, can provide instantaneous information on the rate at which an individual consumes oxygen. Such a monitor can be extremely useful in intensive care units, in operating rooms and in infant incubators; it also makes extensive new research activity possible.

The determination of how much oxygen a patient consumes has been a complex and time consuming process. Several samplings have to be taken and obtained data must be averaged over a certain interval. Results are not always adequately reliable, and always lag behind developments.

The new Technion instrument, developed cooperatively by Dr. Ilan Riess, of the Faculty of Physics, and by Visiting Prof. Bernard Abraham, of Argonne National Laboratory, eliminates all those complications and shortcomings. It is based on a solid state oxygen sensor, which operates at high temperature. The heat source, however, is some distance from the patient and does not cause him any discomfort.

Such monitors will immediately improve the intensive care of adults and especially of infants, where too much oxygen can be as dangerous as too little; they will also provide vital information for anaesthetists. In addition, they give researchers a powerful new tool in the effort to gain a deeper understanding of oxygen consumption by the human organism.

Undergraduate students by faculty 1981/82

Civil Engineering	610	Mathematics	45
Geodesy Engineering	47	Applied Mathematics	33
Mineral Engineering	5	Physics	119
Mechanical Engineering	548	Chemistry	36
Electrical Engineering	1201	Biology	81
Chemical Engineering	129	Economics	102
Food Engineering	63	Computer Science	602
Agricultural Engineering	199	Teaching in Science	35
Aeronautical Engineering	316	Medicine	370
Ind. Eng. and Management	526	Total Non-Engineering Units	1423
Architecture/Landscape Archit.	619		
Total Engineering Units	4263	Grand Total	5686

Undergraduate degrees

Year	#
1927-1941	766
1949-1950	300
1954-1955	473
1959-1960	567
1964-1965	518
1969-1970	877
1974-1975	1063
1979-1980	1007
1980-1981	963
Total over 54 years (1927-1981)	23,861

هكذا من الأصل

Israel's newest and oldest firms in a still-growing industry,
InterPharm and Teva are both leaders in the pharmaceutical field.

Rx for success

IT IS NO accident that when Israel Makov set out to build up a new company, he set his sights on a pharmaceutical firm. The drug industry, he says, has long fascinated him.

"I like the complexity of the whole process, from the initial stages of determining the chemical composition of the drug to the evaluation of its biological effects and the marketing, which in pharmaceuticals is a very sophisticated process."

At 43, Makov heads InterPharm, a newly established company and one of the pioneers in the development of biotechnological medicine in Israel.

"The idea was to build up a company that would exploit the very strong infra-structure Israel has in biomedical research and development," says Makov.

Born in Rehovot, the home town of Israel's distinguished Weizmann Institute of Science and Technology, Makov grew up keenly aware of Israel's scientific potential.

His idea, he says, coincided with the interest of the Dutch-owned, Geneva-based biological pharmaceutical firm, ARES, to provide academics with a potential commercial outlet for their talents. Israel was fertile ground for such a venture.

The risks in such a research-based firm were many, but Makov's credentials were impressive. After graduating with a master's degree in economics and physiology from the Hebrew University of Jerusalem, he had worked for several years with Israel's ministries of finance and agriculture. He had seven years of international marketing experience under his belt, working in the sale of Israeli citrus in Europe.

Perhaps more important, he had spent five years as business manager of a leading Israeli pharmaceutical firm, ABIC, and had concentrated his efforts there on marketing the company's drugs abroad.

So in 1979, Makov got the go-ahead to set up InterPharm as a subsidiary of ARES and he began working out of his home with the help of one assistant.

"We made the move just in time," Makov believes. "The biomedical field is accelerating fast," and InterPharm has managed to stay in the forefront of developments by getting a fairly early start.

THE INFORMAL STYLE that characterized InterPharm's early days continues to be felt even though the company now has a staff of 80, with an additional 30 scientists working at research institutes.

Makov is most comfortable in a sporty tweed jacket. He works in a light-filled, modest office at the firm's new headquarters in the Weizmann Industrial Park of Rehovot, a few minutes drive from the Weizmann Institute.

He is proud of the unique relationship InterPharm has built up with leading research institutes in the country, involving them in the commercial aspect of the enterprise to an unprecedented degree.

"InterPharm acts as a holding company for subsidiaries it owns jointly with research institutes."

InterPharm has a joint venture with Yeda, which concentrates on the development of fibroblast interferon as an anti-viral and possibly anti-cancer drug.

InterPharm recently joined the efforts of Hadassah Hospital researchers on a project to develop a potential drug against auto-immune diseases from alpha-feto, a protein secreted by the human fetus.

INTERPHARM'S link with ARES provides it with an excellent marketing network and the two firms constantly exchange the precious biological raw materials needed for bio-medical production. ARES, for example, exports post-mortem pituitary glands to Israel for InterPharm's production of human growth hormone.

Makov says InterPharm has had no difficulty in overcoming academics' traditional apprehensions about working in applied research.

"On the contrary, many researchers have started to come to us since we have become an available vehicle for their work. We have become an address for them, and we end up not able to take on all the qualified people who apply."

The firm's diffuse set-up allows Makov access to a varied stream of scientists who keep him informed of different aspects of the projects the company undertakes.

"We work with many scientists, in and out of the company, and it means that I am not dependent on one or two department heads before making a decision," he says.

He has enough scientific background to have a good grasp of the fundamental issues facing the researchers. "But coming from the pharmaceutical industry, I sometimes have a better idea of what the end product should look like than the scientists."

He says that part of his task is to see that InterPharm's research yields a product in usable form — a pill, a powder, or an injection. He brings a business perspective to the round-table discussions with researchers that have become a routine at InterPharm.

INTERPHARM'S RESEARCH in the production of interferon places it in the forefront of the debate on the controversial human protein, considered by some scientists to be a potential anti-cancer drug.

Makov does not make exaggerated claims for interferon, which InterPharm began selling to research institutes in the last year.

"Inconclusive findings that interferon might be a natural fighter of cancer created an unjustified atmosphere of public expectation. When the findings did not yield an immediate miracle drug, this led to an atmosphere of disappointment that I believe is equally unjustified."

While the investigations of the use of interferon in cancer therapy will take some time, there are already encouraging signs that interferon is successful in the treatment of viral diseases.

Although Weizmann Institute scientists were at work developing genetic-engineering techniques for the eventual production of biosynthetic interferon, the only readily available know-how at the time was a cell-culture technique set up by InterPharm.

"We had to make a decision on whether to support their research using the new gene-splicing techniques and wait until sufficient progress had been made to justify industrial application, or to immediately start an industrial operation to scale up the laboratory production of interferon by the cell culture technique.

"We realized that this latter technique might become obsolete at a later stage, but it did have the advantage of offering interferon sooner," Makov wrote in a paper recently presented at a conference on business opportunities in biotechnology.

Makov's strategy has allowed InterPharm to get on with the business of production, health-standards testing, product development and pre-marketing activities, while continuing efforts in advancing new and potentially more efficient techniques.

As the company grows, Makov is increasingly involved with setting up a proper managerial framework for the company.

"Often very good technical people don't know how to handle managerial aspects of their jobs, which grow as the company becomes more complex," says Makov. Much of his efforts have been aimed at developing the scientific management the company needs.

"I used to be involved in every aspect of the company, and I was very close to the research and development efforts, but I've had to delegate responsibility and focus on developing communication within the company.

"The more responsibility I delegate, the more time I have. But somehow, it's never enough," he laments.

But creating a new company has been tremendously satisfying: "Making decisions comes naturally to me. I like thinking about long-term strategy, contemplating new ventures, dealing with the budget, which is an education in itself," says Makov.

Some of the intense personal contact of the company's starting days has been lost: "But in various ways, the process repeats itself. When you set up a new labatory or a new division, you come into very close contact with certain people for months," Makov adds.

Joseph Morgenstern

80 years of expertise

TEVA PHARMACEUTICAL INDUSTRIES LTD., Israel's leading producer of pharmaceuticals for human use, chemicals and veterinary products, traces its history back to 1901 and four pioneering companies: Assia, Ikapharm, Teva and Zori.

An impetus was given to the pharmaceutical industry in Palestine in the 1930s when local production was preferred over purchasing supplies from Nazi Germany. It gained further momentum when World War II broke out and local drugs were almost the only ones available to countries in the entire region.

Today's Teva Group is the result of the mergers of the four veteran firms plus the acquisition of several subsidiaries. The mergers took place gradually, in the '60s and '70s, and most recently in 1982.

The Teva Group's wide range of products partly reflects the field of expertise of each of the original companies. Over 500 pharmaceutical products are produced at the Jerusalem (antibiotics) and Kfar Sava (non-antibiotic drugs) facilities.

The company's chemical division produces raw materials for the pharmaceutical division, but most of the production is exported as bulk chemicals.

The third major field of activity at Teva is research and development, for which a separate division has been set up. Over 100 scientists (one-third of whom have Ph.Ds) are engaged in all aspects of Teva's operations and operate in all the company's plants and subsidiaries.

"In the last two years, we have really put a lot of emphasis on original research," says Ben-Zion Weiner, acting director of the R&D division. "We've also improved processes to keep up with increasingly exacting criteria established by local and international health authorities, and our products meet both American FDA and Western European standards."

TEVA'S INTENSIVE research and development programme — into which the company pours some $4 to $5 million annually — focuses on several areas. The most recent fruits of this research are in the diagnostic field. Just last month the company announced that it had completed the development of a new "do-it-yourself" pregnancy detection kit that represents a major innovation in early detection. The kit, which is expected to retail for $9 to $11 is the first colour-indication test in the world in this field. It uses a colour reagent that reacts with urine to give a clear "yes" (blue colour) or "no" (white colour) pregnancy reading in just 15 minutes. The test, which can be done in the privacy of one's home, requires no special skills.

Sterile facility for production of pharmaceuticals at Teva's plant.

Another major scientific achievement is on the other side of the coin. Teva's new drug application — clomiphene citrate — is a compound of particular importance in the treatment of infertility in women. It is produced through a new synthesis, and also undergoes new testing and control methods.

CANCER RESEARCH is another area in which the R&D division is hard at work. Teva already produces a few of the most important anti-cancer drugs on the market, including Vincristine, Vinblastine and Cisplatin. Several other products in the cancer field are in the development stage.

Geriatric research is also high on the list of priorities, especially in the Vitamin D field. In 1979, the company achieved a major breakthrough with the development of Alpha D, which is a vital therapeutic agent in the treatment of crippling diseases of renal and hypoparathyroid origin.

The same basic research paved the way for another break-through — this time in the field of veterinary medicine. Teva's Vetalpha is a product intended to prevent milk fever in cows — a disorder of calcium metabolism of dairy cows, particularly prevalent in older cows. Vetalpha is a synthetic analogue of Vitamin D.

Extensive studies have clearly indicated that it has a powerful effect on calcium metabolism, exerting a more rapid effect than vitamin D itself, and hence making it a valuable therapeutic agent in the prophylactic treatment of milk fever in cows.

Teva's R&D division cooperates with various research institutes and universities in Israel, including the Hebrew University of Jerusalem, the Weizmann Institute and Tel Aviv University. The Office of the Chief Scientist of the Ministry of Industry and Commerce participates in the financing of most of these projects.

Africa is a major export market for the Teva Group's medicines. Income from overseas sales of chemicals comes from Europe and North and South America.

Until recently the group's trade with the U.S. was relatively limited. "All that is changing now," says Dan Suesskind, financial manager of Teva. He cites recent FDA approvals, the acquisition of a U.S. subsidiary — Plantex, USA in New Jersey—and the fact that Teva began trading its American Depository Receipts in the over-the-counter market last February (its shares have been traded on the Tel Aviv Stock Exchange since 1952) as solid indicators of new company goals.

Says Suesskind, "Teva is now aiming at establishing a strong presence in the U.S. market by the mid 1980s."

Lou Blottner

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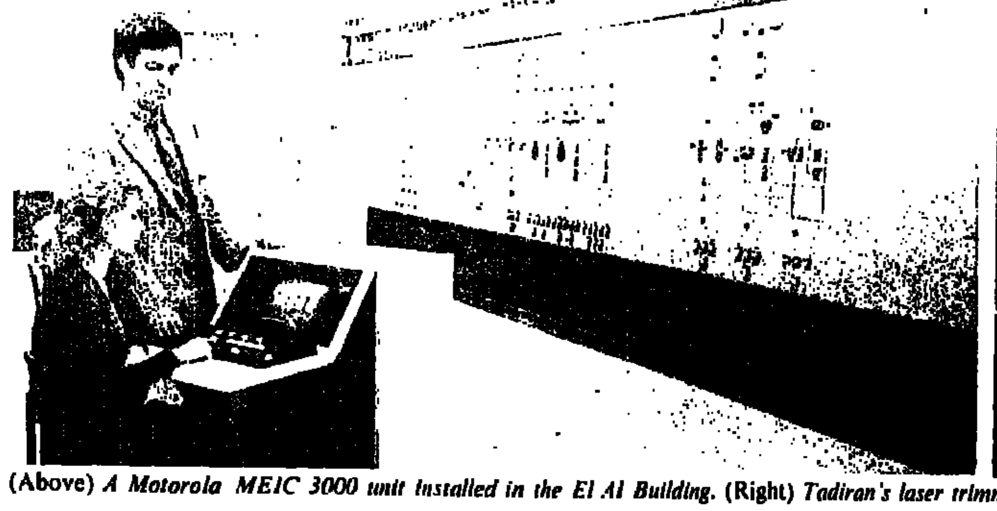

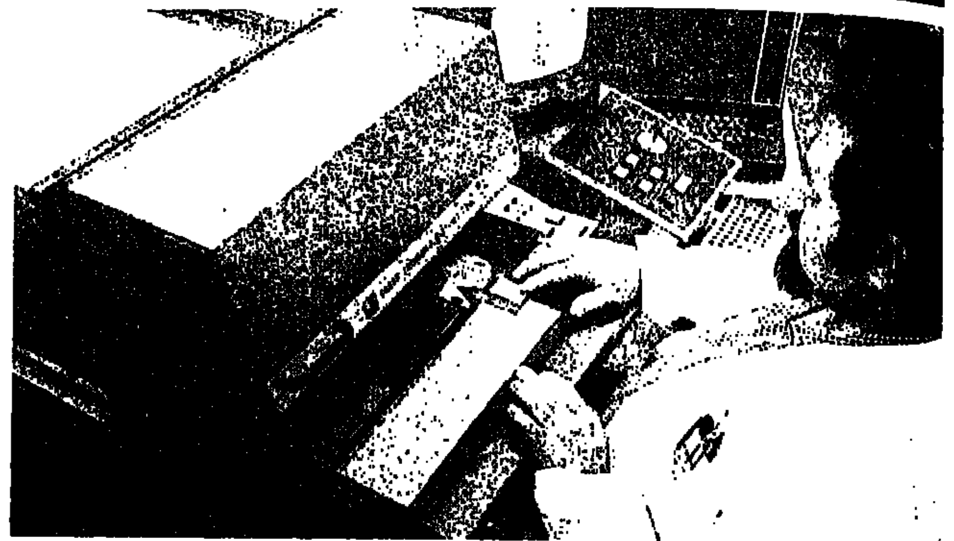

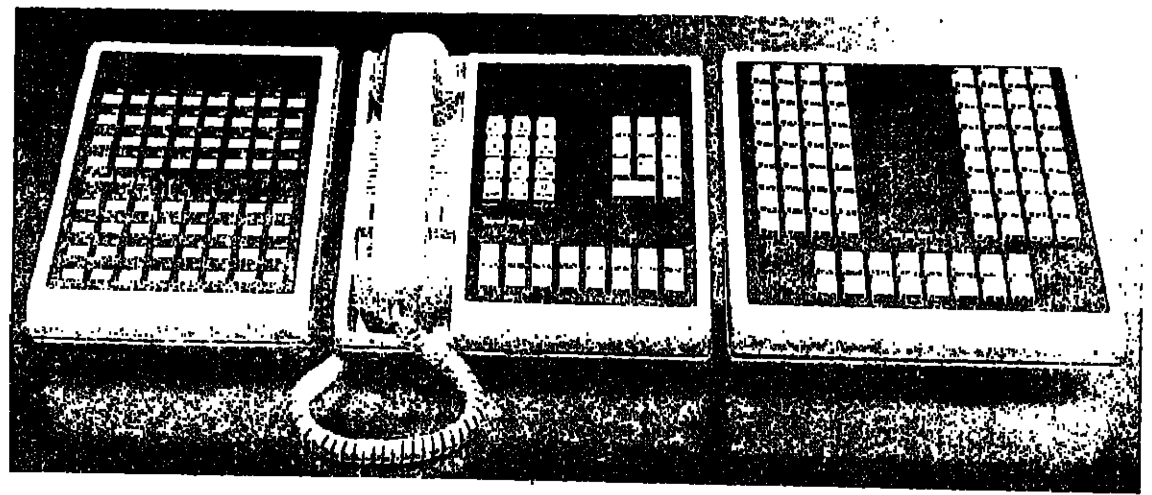

(Above) *A Motorola MEIC 3000 unit installed in the El Al Building.* (Right) *Tadiran's laser trimming system for filming hybrid microcircuits.* (Below) *Telrad's multi-function Key BX switchboard.*

A chip in time

A group of Israeli firms are all very much part of the microprocessor revolution which has swept the telecommunication industry.

THE DEVELOPMENT of microprocessors and electronic digital equipment has had a revolutionary effect on the telecommunications industry throughout the world. And Israeli firms have managed not only to keep up with new developments, but also to create their own profitable niche in world markets.

Telrad, a Koor subsidiary, is one Israeli company which has achieved the transition from electromechanical telephone equipment to fully automated telecommunications systems, in the process raising exports from $1 million in 1978 to $15 million in 1981 on an annual turnover of $65 million. This year's export target is $20 million.

A strong R&D force of 110 employees and an expenditure of 7 per cent of revenues on R&D is one reason the firm gives for its achievements. Says head of the development branch David Raveh: "We can compete with anyone, even the Japanese."

Telrad channels its development activities in two main areas: adaptation and redesign of products for which rights have been acquired abroad, and original development of their own designs.

One of the firm's key products, worked on intensively since 1979, is their Key bx total telephone system, which has achieved substantial sales success. This electronic telephone system has over 20 special features. For example, you can dial with the receiver on the hook, you can store frequently used numbers and speed dial them. Then you can hold a five-party conference call, and activate a do-not-disturb function which transfers calls automatically to another station.

When a line is busy, the speaker can be informed of a waiting outside call, and other stations can call through the loudspeaker while a telephone conversation is in progress.

The optional digital display on each instrument — a first in the field — shows the time, elapsed time call, call-back station number, busy lines and the number dialed. Research for the Key BX project was sponsored by the American Israel Foundation.

Since the system was introduced, a number of variations have been made available, according to needs of individual customers, such as an extention of the number of trunk lines.

Telrad also manufactures a versatile public-line digital exchange system with up to 5,000 lines. This can transmit voice and data simultaneously on the same line by means of electronically coded digital pulses.

What lies ahead for the modern office? According to Raveh, the main trend for smaller business communication systems seems to be in efforts to increase flexibility and reduce costs and time.

TADIRAN, with 1,600 employees in its telecommunications division, of whom 700 are engineers, and with some $30 million earned in exports last year, is one of the largest in the telecommunications field in Israel. It is equally optimistic about the prospects for Israel's penetration into the international market.

"We sell brainpower," says division manager Haim Rosen. "You don't need oil for that."

Tadiran also produces a line of sophisticated electronic telephone systems, which does practically everything in an office but make the coffee. It's features include such things as conference calls, call-queuing (if the line you are calling is busy, the system will automatically keep calling and let you know when the line is free) and night answering.

Other central office systems the company has developed include a computerized telephone directory system, sold to governments in Turkey, Finland and Greece, to look up numbers automatically, and an interceptor system, which automatically provides the new number for a caller who dials the old number.

Tadiran also markets a complete computerized rural telephone system to provide small, isolated communities with the same service available to big-city residents.

In the transmission field, a great deal of research has been done into savings on the vast quantities of copper wire needed to make the connection between the user and the switching premises.

The result has been the development of a range of multiplexer equipment which can take many voice channels, transform them into data and transmit them through pulses over a single line.

Tadiran has been active in developing voice and data products, both digital and analogue, with military and civilian applications.

One of the most promising fields of the future is fibre optics, and Tadiran, which entered the field five years ago, is now testing a fibre-optic telecommunication network system in Israel. The system uses light instead of electro-magnetic signals to transmit. Fibre-optic cables are lighter, smaller and cheaper than copper wire.

Looking into the future, a description of some of the products Tadiran is working on sounds like a science fiction vision of a micro-processor-driven world.

As well as office services systems, which can be linked up to such equipment as copiers, word processors and fascimile machines, Tadiran is experimenting with electronic mail transmission and an electronic voice system which stores a voice message and plays it back at a convenient time.

Ahead, too, lies a cashless community in which shopping, banking and other functions can be done through home terminals. Tadiran plans to be there with the right equipment when that happens.

ANOTHER ISRAELI company which is making efforts to maintain a competitive edge in the expanding computerized communications industry is Motorola Israel Ltd.

Motorola Israel has the advantage of having an American parent firm which is the second largest in the world in semi-conductors and micro-electronic technologies, thus giving them access to the latest state-of-the-art techniques. But the local company also as an extensive R&D programme, on which it spends some 7.5 per cent of its revenue.

Exports amounted to $24 million in 1981, about 40 per cent of the firm's total sales, and major efforts have been made to penetrate the North American market — with some success: about one-third of all exports go to the U.S. and Canada.

The firm's major products include radio communication systems, data communication systems, radio alarms, molitoring and control equipment, as well as a wide range of military electronics.

Particularly successful has been automatic irrigation-control systems, which, as far as possible, computerize agriculture. Sensors in a field give information on such factors as wind, temperature and water pressure, and this is transmitted to a central computer which adjusts irrigation accordingly. The result, according to Motorola, is a saving in energy, labour and water, as well as better corps.

In the field of communications, the firm produces an Intrac 2000 radio-control system which enables a central station to communicate safely and accurately with a number of remote, unmanned units. It can be used, for example, by the military, for security and control of ammunition and nuclear storage areas, or for smoke and fire detection.

Motorola plans to devote efforts in the future to the development of communications equipment, such as radio-telephones, digital line communication and computerized command and control stations.

THE ELECTRONICS CORPORATION of Israel Ltd. — ECI — has also helped put Israeli telecommunications products on the world map with their unique Telephone Line Doubler system.

This system can increase the capacity of trunk lines by detecting the silent periods which occur in normal conversation and filling them with voice signals with the use of sophisticated micro-processors and control circuitry.

Thus, congested telephone trunk lines can carry more than twice as many telephone conversations as they normally do, saving substantial amounts of both time and money. The system is compact, portable and easy to install.

The Telephone Line Doubler has achieved success overseas and is now in operation in 14 countries with exports expected to reach some $9 million this year, up from $3.5 million last year.

Carol Novis

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هكذا من الاصل

Part of the publishing revolution

The age-old craft of printing is not what it used to be, thanks in part to the application of R&D at Scitex in Herzliya.

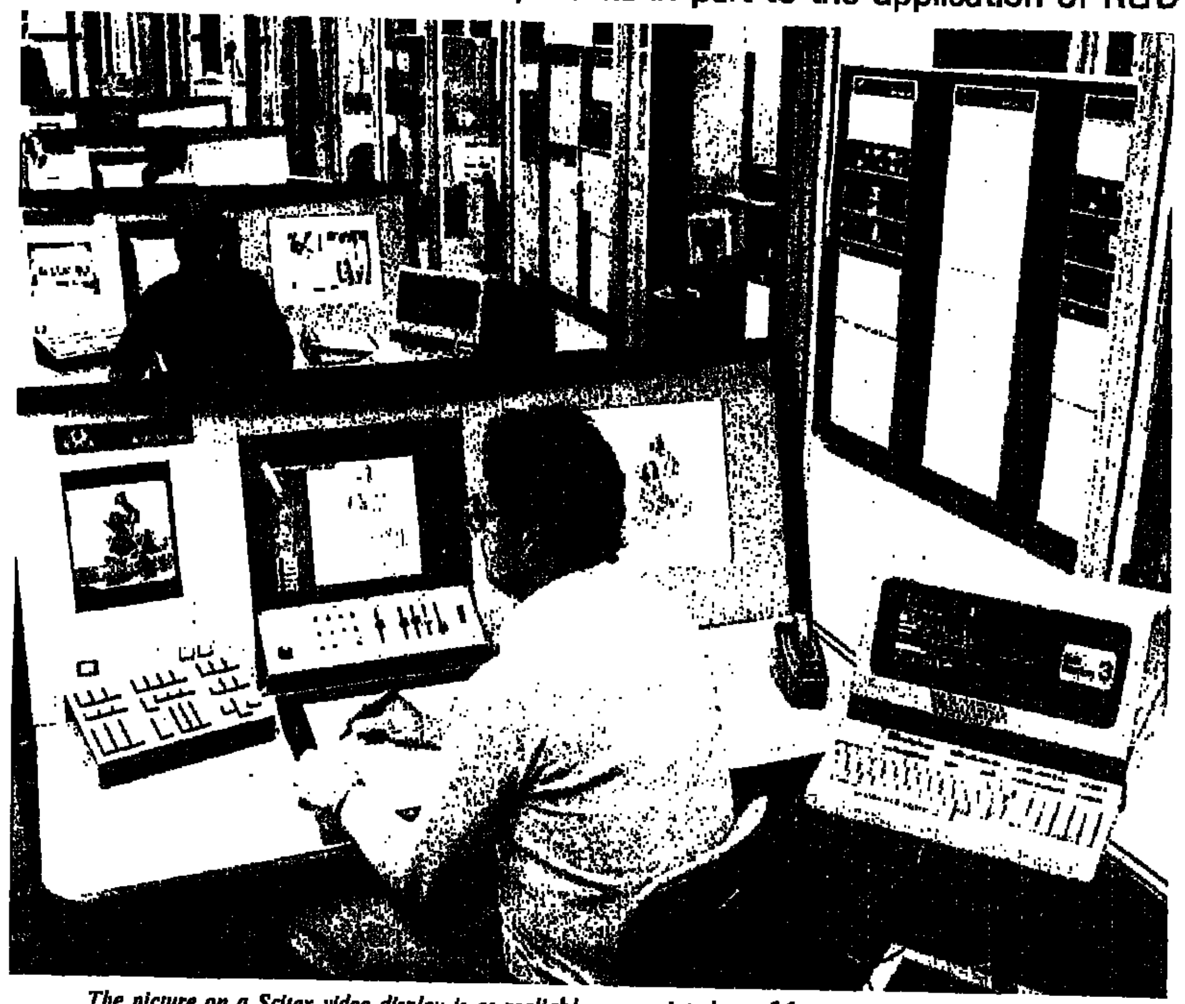
SINCE THE unveiling of the Scitex Response 300 in 1979, the Herzliya-based company has invested more than 300 man-years of research and development to perfect its product line of electronic pre-press systems for advertising, printing, decorative wall and floor coverings and mapping.

Pre-press in the printing business is a collective term for a series of highly specialized and time-consuming manual tasks. Each page is the product of colour separation, retouching, stripping, contact printing, and re-photographing. Scitex has transformed pre-press into a single, stream-lined process by using digital computers, colour video screens, and laser cameras in place of contact prints, negatives, scissors and conventional cameras.

The Israeli firm's continuing stress on technological advances in this field, on product strategy and a broad total system approach, is expected to yield profitability despite the uncertain economic climate predicted in Scitex's American, West European and Japanese markets.

Net consolidated sales for 1981 totalled $34.4 million, up 44.7 per cent from fiscal 1980. Incoming orders in 1981 rose 32.2 per cent over 1980 bookings for a total of more than $36 million.

New product development as well as refinements and improvements on the company's existing systems are major activities at Scitex. Over 140 professionals were engaged in R&D last year. Development and engineering outlays increased by 47.6 per cent over 1980.



The picture on a Scitex video display is as realiable as a printed proof for examination and approval.

A MAJOR PART of these investments was for completing products that expand the Response 300 family into many price and performance configurations. For example, the Response 310 system is for those seeking a lowercost system for their first entry into electronic pre-press, but which will permit a broader capability when business expands.

The Response 350, on the other hand, is the top of the line, for high productivity and accuracy. A major feature of this system is the IMAGER Colour Console, a new full-size work station featuring a high resolution, non-flicker screen and exceptional colour quality.

New options recently made available for Response systems include the ERAY laser, which provides enhanced speed and reliability in film or plate output; the LYNART console for numeric and geometric page layout work; LOGO controllers for mixing of furnished materials (such as bromides) along with all-digital pages produced on Scitex Response systems.

TEXTA, a fifth generation typesetter, offers thousands of one-line fonts for conversion of data from standard composition systems into typeset text with rulings and graphic symbols. It can be connected to a Scitex Response 300 system to input text and galleys in digital form as they emerge from the composition system, without producing galleys and paste-ups in standard photo typesetting.

What Scitex terms a major revolution — its VISTA publications system — is the latest development being offered. For the first time, Scitex claims, the designer of a publication page has a fully automated graphic system, a personal work station for quickly developing the design of a full page, managing all the space, placing galleys, pictures and finished linework in the desired artistic and publishing style without resorting to the traditional — and tedious — make-up process.

VISTA electronically bridges the gap between photo-composition systems and graphic design.

Lou Blattner

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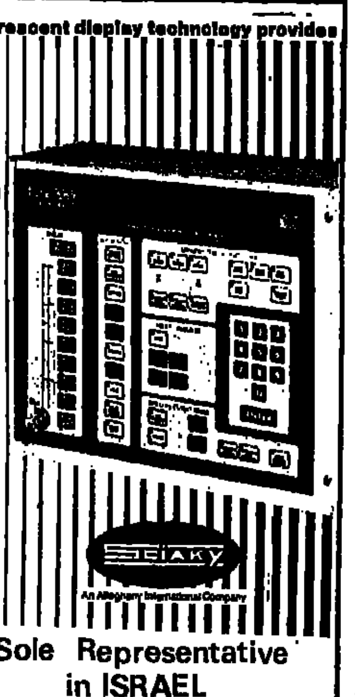

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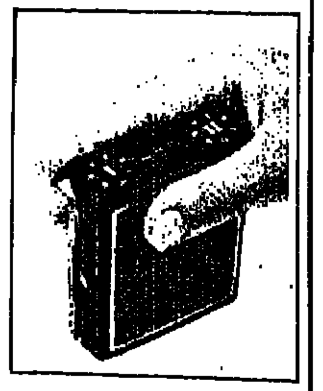

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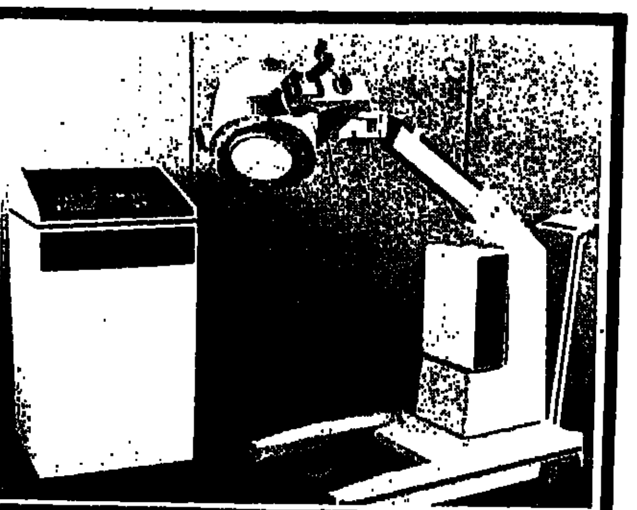
Elscint's image-makers

A small Israeli firm has become one of the leaders in the ultra-sophisticated technology of modern medical diagnosis.



THE SCIENTIFIC and commercial achievements of Haifa-based Elscint Limited have often been hailed as a prime example of the achievement of Israeli "brain-power."

It has been pointed out that the company's ability to compete with some of the world's largest international companies is due to its scientific talent, which numbers more than 350 scientists. The company's corporate strategy in recent years has been to become a fully integrated broad-line diagnostic-imaging equipment company.

Its product line spans the field of CT scanning, nuclear imaging, ultra-sound and initial entry into digital radiography and nuclear magnetic resonance.

By its participation in all areas of imaging, Elscint has assured itself of being counted in the front ranks of major companies in this field.

Elscint was founded in Haifa in 1969 by a group of physicists who had graduated from the Technion — Israel's Institute of technology — and Elron Electronic Industries Ltd. Elron today owns one-third of the outstanding shares of Elscint.

It was headed by Dr. Avraham Suhami, current chairman of the board and chief executive officers. In the company's first year of operations, it sold some $1m. worth of laboratory instruments for research purposes. Management soon realized that this line showed little promise for the future, and R&D efforts were aimed at producing a more sophisticated product line.

The result was a rectilinear gamma scanner which uses a computer to reconstruct images of organs under examination. The product showed sufficient promise that the American General Electric company agreed to represent Elscint for this product line in North America.

The company extended its activities in the CT-scanner field, and while other concerns in the field were forced out, Elscint began to pick up a more meaningful portion of CT scanner sales world-wide.

In the late 1970s, Elscint introduced its Excel-CT Model, which sold in the range of $500,000 to $600,000, and proved to be highly competitive. To make it competitive, Elscint introduced an innovative technological approach which resulted in the machine's ability to use fewer detectors than its competitors.

In addition, Elscint scanners use a movement which combines lateral translation and rotation which, while more complicated than the movement of scanners offered by its competitors, is nevertheless considerably more economical as it requires fewer detectors.

Elscint also accelerated the machine's ability to reduce the scanning time to a few seconds, while some of its competing products take up to two minutes to achieve the same task.

Originally, Elscint used imported mini-computers in its line of CT and imaging equipment. The experience acquired allowed the company to produce its own medical computers, which resulted in an improvement of speed and a reduction in cost as well.

Elscint's ability to design and manufacture its own medical computer, which includes an array processor along with a memory computer, was first seen in its Exel-905 Whole Body CT Scanner. It has subsequently refined this computer to an even higher level of efficiency. By producing its own computer system, further economies were achieved because most of the components used by Elscint in the nuclear medicine systems are also being used by Elscint in its line of ultra-sound products.

It has been estimated that in 1982, Elscint will produce approximately 400 medical computers which can be used nearly interchangeably in its nuclear medicine or ultra-sound equipment.

In 1983, the same computer will be employed in a totally new CT scanner. Industry analysts have pointed out that this ability will allow the company to widen its profit margins and to improve its overall quality.

IT HAS BEEN estimated that the international market for computer tomography (CT) is in the order of $600m., with a foreseeable growth rate of 10-15 per cent annually over the next few years.

In 1982, Elscint should expand its 10 per cent share of the market, and further growth is to be expected in years to come.

The history of the growth of the use of CT Scanners can be visualized from the following table.

	Estimated CT Shipments U.S.	International Units	Total
1974	35	10	45
1975	200	70	270
1976	300	100	400
1977	450	235	685
1978	225	200	425
1979	170	250	420
1980	225	300	525
1981	325	400	725

In the U.S., the Health Department must issue a certificate of need approval for hospitals which intend to purchase a CT Scanner. Recently, there has been a marked increase in the amount of certificates issued. Furthermore, the prevalent view is that one should not consider the high cost of the CT scanning equipment in itself, but rather the cost of the examination, which is determined largely by the amount of time a physician spends on an examination.

It has been discovered that the depreciation of leasing costs are more than covered by the daily income if the utilization level is reasonably high.

The growth of this market is being further enhanced by the fact that smaller hospitals and clinics are beginning to use this equipment on a sharing basis. Sharing can be done by the use of mobile vans which make the CT Scanner available on a pre-arranged basis. Elscint now sells the system which transmits CT images to other hospitals by way of telephone lines. Radiologists in private practice are also becoming an important factor in this market.

THE REQUIREMENT market is growing rapidly, too. In the 1975/76 period, there were some 500 machines sold on a five-year full pay-out lease basis. These now represent prime possibilities for replacement.

THE NUCLEAR MEDICAL imaging industry is worth in the order of $250m. a year, with an anticipated annual growth of 15-20 per cent over the next few years. The extent of the industry's international nuclear equipment sales and the division of sales may be seen from the following tables.

Worldwide Nuclear Equipment Sales — 1981E

	Gamma Cameras	Data Processors	Integrated Systems
U.S.	850	400	55
Foreign	750	400	45
Total Units	1,600	800	100
Average Unit Price	$110,000	$75,000	$150,000
Total Sales	$175 million	$60 million	$15 million

Nuclear Medical imaging equipment sales by manufacturer are estimated to be roughly as follows:

Worldwide Nuclear Equipment Sales — 1981E,
By Manufacturer
(in millions)

Siemens	$ 60
Technicare (J&J)	40
Picker (GEC)	25
Elscint	25
MDS (Medtronic)	25
ADAC	20
GE	15
Toshiba	15
Informatek	10
Other	15
Total	$250

Elscint's estimated nuclear medical instrument sales are shown below.

	Fiscal Years Ending 3/31 1977	1978	1979	1980	1981E	1982E
Sales 1000's	$10,542	$11,505	$12,206	$13,122	$10,000	$27,000
% Annual Change	(1)%	+9%	+6%	+8%	(23)	+170%

ELSCINT'S MAJOR participant in the nuclear-imaging field is the Apex family Model 415, which is a large field of view camera which sells for about $165,000. The Apex line uses Elscint's proprietary-imaging computer. The company's approach to the product is believed to produce very refined images as well as being able to provide more accurate quantitative information. This is particularly useful for cardiac application. An impressive feature of the Apex's specifications is its unusually high speed of up to 500,000 counts/second compared to about 150,000 counts/second for competitive products. This is valuable for diagnosing heart disease since it records more images per heart cycle with higher information content as compared with competitive products. Deliveries of the Apex line began in the latter part of 1980. Current production is at a rate of 15 units a month, which is under the company's total capacity. The American market's initial response to the Apex line has been very positive.

THE WORLD-WIDE market for ultra-sound equipment is in the order of 10,000 units a year.

Elscint has developed a real-time ultra-sound system for imaging the abdomen, trademarked Dynex. The system incorporates a modified version of the same computerized data-processing system which was developed for the Apex nuclear medicine system.

The Apex line is highly competitive in price. It has been Elscint's basic strategy to enter the market rapidly in this area and, due to its competitive pricing, profit margins are relatively low. As such, this line is not expected to contribute materially to profitability in the foreseeable future.

PART OF THE design and development work on the Dynex line was carried out at Elscint's Facility in Cambridge, Massachussetts, which marked the first entry into manufacturing on the American continent.

Two new areas which are considered musts are digital radiography and nuclear medical resonance.

Digital radiographic systems might be described as those in which the detected X-ray information is converted into digital form and made available for processing and subsequent display.

Such systems have resulted from efforts to combine digital capabilities with the projection format of standard radiographic and fluoroscopic equipment. Although the configurations and capabilities of these emerging systems are not yet clearly defined, they can be categorized as a new modality in diagnostic imaging, known as digital radiography.

Digital radiography provides a major advantage in that radiologists can examine the image produced for blockages and for normal patterns that are important in the diagnosis of tumors, congenital malformations and other diseases which cause changes in arteries and veins.

Digital radiography's main advantage is that it allows the physician to obtain — in a safe way and on an out-patient basis — information that previously required hospital admission.

The cost effectiveness of digital radiography can be realized by noting that carotid angiography, which is used in the diagnosis of arterial blockage in the arteries of the neck leading to the brain, can now be performed by digital radiography at a greatly reduced cost. The cost of applying digital radiography is approximately $300, compared with hospitalization costs, radiologist costs and special radiology procedure room costs for angiography, which may amount to as much as $2,000.

It is anticipated that the first digital radiography unit will be exhibited in November.

NUCLEAR MAGNETIC resonance is a new diagnostic technology that may have a substantial impact on medical diagnostics in the 1980s.

The NMR phenomenon is made of the atomic nuclei of certain isotopes, such as hydrogen-1, fluorine-19 and phosphorus-31, which behave like tiny magnets in a magnetic field, the nuclei aligning themselves with the field.

When exposed to radio waves of a certain frequency, the nuclei absorb some of the radio waves' energy by vibrating at the same frequency — that is, they resonate much as the column of air in a trumpet resonates when excited by the trumpeter's lips. This resonance can be detected electronically.

Nuclear magnetic resonance spectroscopy has been used in chemical analysis for decades and it is an extremely sensitive way of measuring the chemical environment of different nuclei within a sample. Diagnostic NMR imaging is a similar application, differing mainly in that laboratory NMR spectroscopy instruments give information averaged over the entire sample, while clinical NMR imaging instruments must be designed to resolve the location of the resonance within the sample in order to produce an image.

Clinical NMR can be used to produce two-dimensional cross-sectional images of the body and also to measure average chemical composition. The most important clinical advantage of NMR is its ability to provide information about the chemistry of tissue without invasion and without exposure to ionizing radiation.

Both major computerized diagnostic imaging modalities currently utilized — X-ray computed tomography and ultrasound — primarily sense differences in tissue density.

Because important disease states, such as early tumorigenesis, inflammation and ischemia produce little or no change in tissue density, they often go undiagnosed by CT or ultrasound. However, since these same disease states substantially alter tissue chemistry, they could be detected by NMR.

Elscint is active in the development of NMR devices and it is anticipated that it will be priced in the order of $1.5 million.

Elscint's rapid progress can be traced to its scientific capabilities. In 1982, the company announced a three-year research-and-development programme which will involve the investment of $60m, including outside grants. Approximately one-third of this sum will be financed from various sources in Israel, as well as the U.S., Britain and France.

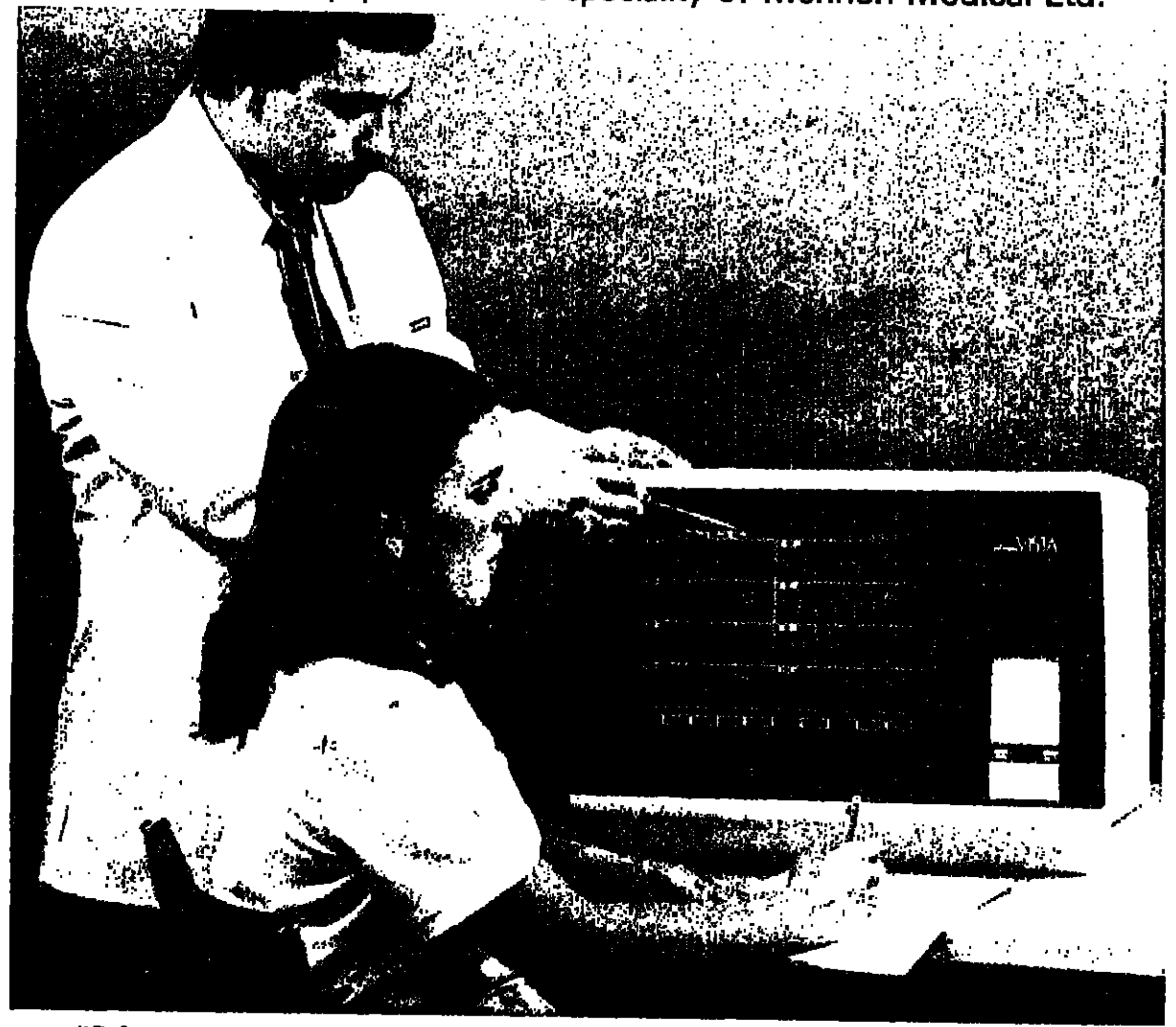
The company anticipates some $11m. from its own funds in 1983, and $16.m. in fiscal 1984. In the same period, it is expected to result from volume-related economies and initial benefits from increased vertical integration.

In the field of CT, there are two important R & D programmes underway: One of these is to produce a successor to the Exel-2002 model and an advanced-technology CT with potential application by dynamic cardiology and brain function studies. At present, CT images only provide static anatomical views.

Joseph Morgenstern

Early-warning medicine

Intensive care equipment is the speciality of Mennen Medical Ltd.



DURING Operation Peace for Galilee, about 35 of the 160 workers of Mennen Medical Ltd. were called up for reserve duty.

"It was tough, production fell, and it was difficult to fill our orders. But just the same, we managed to honour our commitments to local hospitals, shipping electronic equipment to them that was scheduled to be delivered only in September this year."

This is how Moshe Barone, managing director of Mennen Medical Ltd., describes how his company managed during the war.

The Israeli company is a wholly owned subsidiary of the American firm, Mennen Medical Inc., which owns 50 per cent of the company here, the remaining 50 per cent being owned by Clal industries.

Barone describes with a hint of nostalgia how he started the company in one room inside the Weizmann Institute 15 years ago.

The speciality of the firm is medical equipment for hospitals, particularly for intensive-care units, operating rooms and recovery rooms. Over the years, the company has developed equipment for use in this field, more specifically in the field of cardiology.

AT FIRST, Mennen produced equipment that originated in the United States. But within a short time, Israeli ingenuity had taken-over and the company started manufacturing entirely Israeli-developed products.

In 1972, the plant moved out of the Weizmann Institute to its present location at the Kiryat Weizmann Science-based industrial park in the Rehovot-Nes Ziona area.

Today, the plant exports to markets in Europe, Asia and Africa. The company's sales have grown from about $50,000 in 1970 to over $6m. in 1981, of which 90 per cent was in exports.

In recent years, the company — with the aid of its research and development resources — has managed to expand its activities in the development of patient-monitoring equipment, expanding this to "decision support system for critical care" and cardiovascular study.

Barone is justifiably proud of his company's new generation of equipment: "Before our new equipment was introduced, the main function of similar equipment was to alert the medical staff when some abnormality occurred in the condition of the patient being monitored.

"The advance systems which our company has now developed serves also as a data-management tool, assisting medical staffs in hospitals to make decisions.

"This has been accomplished through the extensive application of computer technology, which has enabled the integration of information from numerous sources on the patient.

"This data is collected, analyzed and is available for convenient and immediate retrieval for the decision-makers at the critical-care unit."

Barone adds almost apologetically: "In this particular niche of the industry, our company in Israel is the world leader."

MENNEN MEDICAL LTD., which was previously called MG Electronics, seems to be growing and changing all the time, a result of its rapid development of new products.

The best example of this is the story behind the development of cardiac pacemakers. The success was so great that about six months ago, Mennen Medical had to form a new subsidiary company (jointly owned by Mennen and Danot Industries) called Omikron Scientific Ltd.

At present Omikron is located at the Mennen Medical plant, but by the end of next month it will move into its own plant, also at the Kiryat Weizmann Science-based Industrial Park.

Omikron is now coming out with an advanced multi-programmable pacemaker which is much lighter and smaller than the present generation of pacemakers. And Barone is confident that this new pacemaker will be able to compete in foreign markets with the pacemakers currently available.

According to Barone, Omikron is also planning to enter a challenging new field through a project being carried out jointly with the University of Southern California. The project deals in an implanted insulin pump (an artificial pancreas).

At present, Mennen Medical has a payroll of 160, after "losing" 20 workers who were transferred to Omikron.

"We are always on the look-out for good engineers and product managers, but we also need marketing people," says Barone.

He is proud of the fact that over the years his company has managed to bring back over 40 Israelis who had made their way overseas — and that it has provided employment for new immigrants from the West, who made Israel their home as a result of the jobs they landed at Mennen Medical.

BARONE does not underestimate the importance of the 10 per cent of the company's products that are sold locally: the sale, he points out constitutes about 80 per cent of the needs of the local market.

What of the future? The company is hedging its bets on its Vista Video Technology equipment. Barone says the company has a lead on one or two years over its competitors in this equipment. And he is confident that by the time the competition catches up, Mennen will be ready to produce new models — one that is more sophisticated and also sells at the same price as the present models.

He admits that this puts Mennen Medical in a constant race to capitalize on its investments in a short time before it must change their product.

But his confidence is such in the Vista products that he is sure the company will be able to double its exports within two or three years — despite the very intensive competition from abroad and the limited budget for health-care equipment.

Yitzhak Oked

Computers at the front

In operation Peace for Galilee, up-to-the-minute information has been available at the press of a button.

WHEN PEOPLE discuss the "electronic" aspect of Operation Peace for Galilee, they are usually talking about the astonishing success of Israel's Air Force — how it knocked out the Syrian missile system and brought down scores of Syrian warplanes.

But the present war was also the testing ground for other electronic equipment, most of which will not be made public for a long time to come.

According to David Assia, managing director of Mashov, an importer and consultant on micro-computers, the Lebanon war was the first war in which micro-computers played a major role.

Without micro-computers, says Assia, politicians and generals would not have been able to receive up-to-the-minute information on the fighting. As it was, the information was immediately available at the press of a button.

The IDF, he says, has several huge computers which store all of the IDF information. But because it is large it has some drawbacks. These include the fact that during a time of emergency and war, many people seek information from the data banks, and a queue develops. As a result, information which should take only minutes to receive can take hours.

And that is where the portable micro-computer really comes into its own. According to Assia, each unit should have its own micro-computer programmed for its individual needs. In this way it will reduce the strain on the main computer.

He is confident that when the strategists come to assess the war, they will attribute much of its success to the micro-computer — and will reorganize the IDF accordingly.

Assia says that several of his colleagues who deal in micro-computers, literally took their micro-computers with them to war when they were called up: "There are quite a few micro-computers at the IDF, but some of the men chose to work with equipment that they are used to."

He has made up a software programme for one specific problem he had to tackle for the IDF during the war. He worked on the problem at his office through an entire night while he was on leave, and estimates that his work probably saved both money and valuable time for the IDF.

WOULD IT not be too expensive to keep a large stock of expensive micro-computers which would be used only during times of emergency and war?

Assia concedes that this is a problem. If the IDF buys, say, 100 micro-computers and stores them for use only during times of emergency, these micro-computers would be almost obsolete in two to three years time.

As the owner of a micro-computer importing firm, he is not too keen on having micro-computers doing reserve duty.

But he does have a practical solution to the problem. In times of emergency, he proposes, the IDF could use the micro-computers in Israel's various universities. The universities already have several hundred micro-computers. This number is increasing all the time — and the micro-computers themselves are being up-dated as they are acquired.

No great harm would be caused by using the universities' equipment: in times of emergency and war, many of the students and professors are called up anyway and the expensive machinery is then left idle.

ASSIA says that as computers become smaller and more portable, many functions of war will have to be carried out with the aid of these little electronic devices. And in order for Israel to retain an edge over its enemies, the government must recognize the importance now of micro-computers for this purpose.

Much more effort must be given to educating the Israeli youth — as early as possible — in the computer sciences. To make these sciences even more attractive, he recommends, taxes on small computers should be lowered considerably, or even abolished, so that more young people — and then parents — can afford them.

He admits that he has a vested interest in this as he is keen to sell the equipment, but he is confident that these cuts in taxes will ultimately benefit the nation. The more young people use these computers, the more they will learn about the various computer software programmes.

"These software programmes can provide a big boost for Israel, not only during times of war, but also in peace time.

"Since there is a large, hungry market in the world for software, this is an area that the Jewish ingenuity can compete in — and bring in export dollars for Israel."

Yitzhak Oked